

AD-R154 810

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
CONWAY ELECTRIC DAM (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV MAR 81

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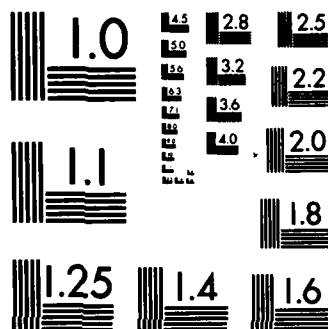
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AD-A154 810

CONNECTICUT RIVER BASIN
CONWAY , MASSACHUSETTS

CONWAY ELECTRIC DAM
MA 00463

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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DEPARTMENT OF THE ARMY
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WALTHAM, MASS. 02154

MARCH 1981

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Connecticut River Basin Conway, Massachusetts South River		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Conway Electric Dam is about 265 ft. long with a maximum height of about 77 ft. The dam appears to be in poor condition. The dam is placed in the intermediate size category and has a hazard potential if significant. The owner should implement various operations and maintenance procedures.		



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:
NEDED

APR 2 1981

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

Inclosed is a copy of the Conway Electric Dam (MA-00463) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, Commonwealth of Massachusetts, Department of Environmental Management, 100 Cambridge Street, Boston, MA 02114.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely,

A handwritten signature in dark ink, appearing to read "C.E. Edgar, III".

C.E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

CONWAY ELECTRIC DAM

MA 00463

SOUTH RIVER BASIN

CONWAY, MASSACHUSETTS

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PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

Identification Number:	MA 00463
Name of Dam:	Conway Electric Dam
Town:	Conway
County and State:	Franklin County, Massachusetts
Stream:	South River
Date of Inspection:	December 2, 1980

BRIEF ASSESSMENT

Conway Electric Dam is approximately 265 feet long with a maximum height of about 77 feet. The dam consists of a 110-foot long overflow section which is a rock filled timber crib covered with concrete and a non-overflow section consisting of a concrete and masonry wall plus an earth embankment. The abutments and the base of the dam appear to be founded on bedrock. The original dam was a rock filled timber crib about 55 feet high and 90 feet long built in 1898. The dam was enlarged to the extent described above around 1910. From 1898 to 1921 the dam impounded water for hydroelectric power generation for the Conway Electric Street Railway Company. Since 1921, the area in the vicinity of the dam has been used for recreation.

A 4-foot square timber sluiceway, located at the center of the base of the overflow section, has not been functional since 1921 when it was plugged with concrete by Conway Electric Street Railway Company when they abandoned the site.

The stone masonry headworks and the 5-foot diameter boiler plate penstock to the original powerhouse, which are located about 150 feet north of the dam, are in poor condition. The headworks and penstock have also been abandoned and all that remains of the powerhouse is the stone foundation.

The dam appears to be in poor condition. However, the spillway discharge condition at the time of the inspection prohibited a thorough inspection of the overflow portion of the dam. The non-overflow portion of the dam appears to be in fair condition. Some minor cracking is evident in the masonry and concrete wall. The earth embankment has an irregular top width, steep side slope (varies 1H:1V), varying crest elevation and many large trees (up to 24-inch trunks and 50 feet high) growing both on the slopes and the crest. Seepage (5 gpm) was noted along the north side of the spillway.

Conway Electric Dam has a maximum height of about 77 feet which places it in the "Intermediate" size category. The initial potential hazard area is considered to be the Stillwater Bridge over the Deerfield River approximately 2.5 miles downstream of Conway Electric Dam. Although the bridge deck would be about 26 feet above the flow caused by a breach of the dam, appreciable damage could occur to the bridge supports; however, no loss of life is probable.

Due to the above considerations, Conway Electric Dam is classified in the "Significant" hazard potential category. The recommended test flood for an "Intermediate" size, "Significant" hazard dam ranges from one-half of the Probable Maximum Flood (PMF) to the full PMF. Due to the potential for appreciable property damage, the selected test flood is one-half of the PMF.

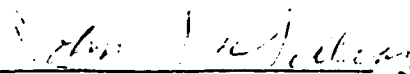
The test flood peak inflow to Conway Electric Dam is 26,800 cfs. The routed test flood outflow of 26,800 cfs overtops the spillway crest by 16 feet and the top of the dam (concrete abutment at north end of overflow section) by nine feet. The spillway system is capable of discharging 6,650 cfs prior to overtopping of the embankment, which is approximately 25 percent of the routed test flood outflow.

Within one year of receipt of this Phase I Inspection Report, the Owner (Commonwealth of Massachusetts, Department of Environmental Management) should retain the services of a qualified, registered professional engineer experienced in the design and construction of dams for the following purposes: 1) inspect the dam during a low or no flow condition and recommend measures to be taken to insure the future integrity of the dam; 2) design and direct the installation of a reservoir drawdown system; 3) perform detailed hydrologic and hydraulic analyses to assess the need for increasing the project discharge capacity and to evaluate the ability of the structure to withstand overtopping; 4) investigate the source and nature of the seepage observed along the north side of the spillway; and 5) direct the removal of all trees and their root systems from the embankment portion of the dam including a 20-foot wide strip beyond the downstream toe of the embankment and direct the backfilling of any remaining voids with suitable thoroughly compacted material.

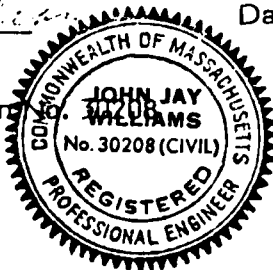
In addition, the Owner should implement the following operational and maintenance procedures: 1) remove brush from the earth embankment portion of the dam; 2) establish and maintain vegetative cover on the embankment portion of the dam; 3) institute a program of annual technical inspection of the dam; 4) establish and implement a regular maintenance program of the dam; 5) develop a downstream warning system.

As an alternative to the above recommendations and remedial measures, the lake could be drained and the dam removed.


O'BRIEN & GERE ENGINEERS, INC.



John J. Williams, P.E.
Vice President
Massachusetts Registration


Date: 25 FEB 1987



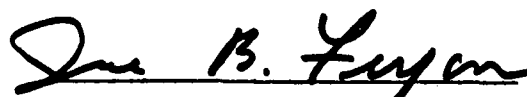
This Phase I Inspection Report on Conway Electric Dam (MA-00463) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.


JOSEPH W. FINEGAN, JR. MEMBER
Water Control Branch
Engineering Division


ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division


CARNEY M. TERZIAN, CHAIRMAN
Design Branch
Engineering Division

APPROVAL RECOMMENDED:


JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation: however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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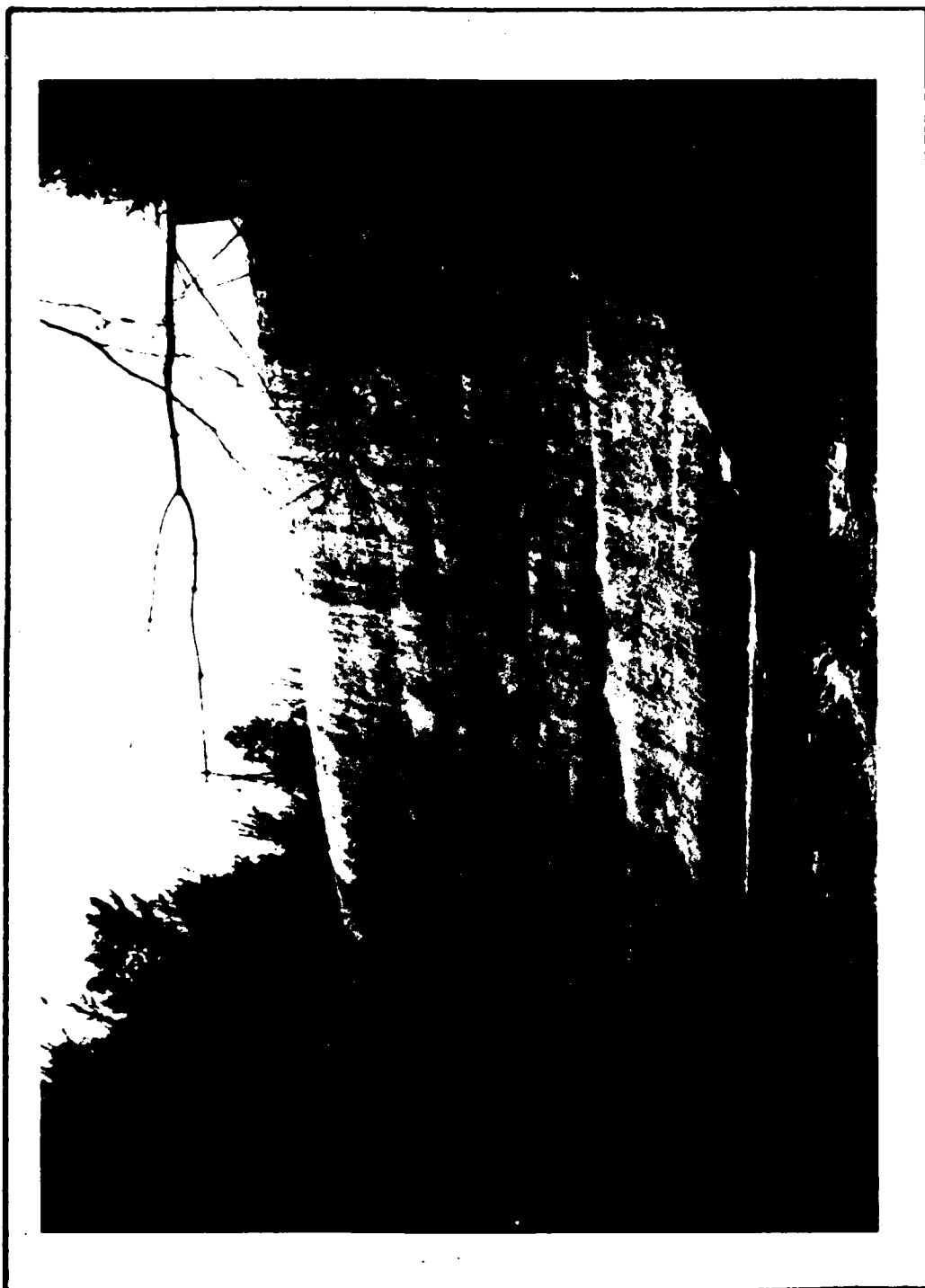
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OVERVIEW OF THE DAM AS OBSERVED FROM DOWNSTREAM OF THE LEFT ABUTMENT (12/2/80)

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

During the inspection, the Ogee spillway overflow portion of the dam was submerged, thus observations and an appraisal of the structural condition of the Ogee surface were somewhat limited. The crest of the overflow section appears to be in poor condition with many areas of missing concrete (refer to photograph 4, page C-2). The downstream face of the Ogee Spillway, where visible, appears to be spalled and eroded in horizontal lines (Refer to the overview photograph and photograph 3, page C-2). The masonry and concrete non-overflow wall north of the overflow section appears to be in fair condition with some minor cracking near the south end of the wall. The earth embankment north of the wall has an irregular top width, steep side slopes (varies 1:1), varying crest elevation and many large trees (up to 24-inch diameter trunks and 50 feet high) growing both on the slopes and the crest. Seepage (5 gpm) was noted along the north side of the spillway in the region where the spillway ties into the bedrock abutment. These conditions are discussed in greater detail in Section 3.

6.2 Design and Construction Data

Prints of the original plans and specifications from 1897 for Conway Electric Dam were provided by Mr. John R. Moseley, Clerk of the Courts, Franklin County, Greenfield, Massachusetts. No actual design data or construction information is available relative to the original design and construction in 1897 and 1898.

6.3 Post Construction Changes

About 1910 concrete was placed over the existing structure and the crest of the overflow section was raised about 15 feet. A concrete and masonry wall approximately 55 feet long was built north of the overflow section. North of the wall an earth embankment about 100 feet long was built which blended into the north abutment. No other known modifications have been made to the structure.

6.4 Seismic Stabilities

Conway Electric Dam is located in Seismic Zone 2 on the "Seismic Zone Map of Contiguous States." A dam is located in Seismic Zone 2 need not be evaluated for seismic stability, according to the Recommended Guidelines for Phase I Dam Inspections.

vertical side slopes developing within one hour. The failure was assumed to occur with the reservoir surface at the crest of the overflow portion of the dam, Elev. 298. The resulting breach discharge was routed to the initial damage center which is considered to be the Stillwater Bridge over the Deerfield River about 2.5 miles downstream of the Conway Electric Dam. The approximate channel cross-section at this point is shown on page D-5.

The failure analysis indicates that a breaching of the dam with the reservoir surface at the crest of the overflow portion of the dam Elev. 298, would result in discharge in the Deerfield River about 26 feet below the deck of the Stillwater Bridge with a flow of 2570 cfs. Just before the assumed failure of the dam, no discharge would be passed through the dam because the stage of the water in the impoundment would be at the crest of the overflow portion of the dam. Appreciable damage could occur to the bridge supports, but no loss of life would be expected.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

The total drainage area for Conway Electric Dam is approximately 26.1 square miles consisting primarily of forested mountainous terrain. The towns of Ashfield and Conway are the only population centers within the drainage area. The topography ranges from roughly El. 1800 at the farthest upstream point in the watershed to approximately El. 300 at the reservoir. Ashfield Pond is the only other impoundment in the drainage area.

5.2 Design Data

Neither hydraulic nor hydrologic design data is available for Conway Electric Dam.

5.3 Experience Data

According to the Owner's representative, no rainfall or reservoir level records are known to exist for this site.

5.4 Test Flood Analysis

The recommended test flood range for an "Intermediate" size, "Significant" hazard dam is from one-half of the Probable Maximum Flood (PMF) to the full PMF. Based on the potential for appreciable damage to the supports of the Stillwater Bridge 2.5 miles downstream of the dam, the selected test flood is one-half of the PMF. Hydrologic and hydraulic calculations were performed with the assistance of the HEC-1-DB computer program. The flood hydrographs were constructed from the Snyder unit hydrographs using average coefficients, an initial infiltration of zero and a constant loss rate of 0.05 inches per hour. The Hop Brook adjustment factor¹ was used to reduce the Probable Maximum Precipitation based on the size of the drainage area. Stage vs. discharge and stage vs. storage relationships were developed for Conway Electric Dam. The relationships were utilized by the program to route the test flood through the dam. The reservoir water surface was assumed to be at the spillway crest elevation at the beginning of the storm event.

The peak inflow and outflow rates for the test flood at Conway Electric Dam were computed to be 26,800 cfs. The peak outflow corresponds to a stage of 16 feet above the spillway crest or 9 feet above the top of the dam elevation. The spillway discharge capacity with the reservoir surface at the top of dam El. 305 is 6,650 cfs which is approximately 25 percent of the routed test flood outflow.

5.5 Dam Failure Analysis

A failure of the overflow portion of the dam was simulated by use of the HEC-1-DB computer program assuming a 36-foot wide by 70-foot deep breach with

¹Corps of Engineers, Engineer Circular No. 1110-2-27, Aug. '66.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General. According to the Owner's representative, no operating procedures exist for Conway Electric Dam because of the absence of a drawdown system.

b. Description of Any Warning System in Effect. According to the Owner's representative, no warning system exists which could be used to alert downstream property owners of an impending dam failure.

4.2 Maintenance Procedures

a. General. According to the Owner's representative, maintenance is not performed on a regular basis on the Conway Electric Dam.

b. Operating Facilities. Because no operating facilities exist on the site, no maintenance can be performed.

4.3 Evaluation

A regular maintenance program and warning system should be developed and implemented for Conway Electric Dam.

d. Reservoir Area. The reservoir is almost entirely filled with sediment. The maximum depth of water in the impoundment is estimated to be about 5 feet in the immediate vicinity of the Ogee spillway section. The freeboard between the spillway crest and the top of the concrete and masonry wall north of the spillway is roughly 7 feet. The reservoir side slopes on the periphery of the reservoir are densely forested and vary from about 20 to 100 percent.

e. Downstream Channel. South River flows through a narrow, twisting, densely forested, boulder strewn gorge between Conway Electric Dam and the Deerfield River approximately 3,500 feet downstream. The invert of South River drops about 70 feet in this distance. About 11 miles downstream of the dam the Deerfield River discharges into the Connecticut River.

3.2 Evaluation

The dam appears to be in poor condition; however, the Ogee spillway overflow portion of the dam could not be closely inspected because of the amount of discharge at the time of inspection. An inspection should be made of this portion of the dam during low or no flow conditions. All trees on the non-overflow northern portion of the dam should be removed. Some means of drawing the reservoir down should be provided. The seepage observed along the north side of the Ogee spillway should be investigated.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. The field inspection of Conway Electric Dam was performed on December 2, 1980. At the time of the inspection, the reservoir water surface was approximately 3 inches above the spillway crest elevation. No underwater areas, other than what could be seen from above the water surface, were inspected.

The observations and comments of the field inspection team are in the checklist which is Appendix A of this report.

b. Dam. During the inspection, the overflow section of the dam was submerged, thus observations of the Ogee spillway surface were somewhat limited. The crest of the overflow section appears to be in poor condition with many areas of missing concrete (Refer to Photograph 4, page C-2). Even with the limited visibility of the downstream face, the Ogee spillway appears to be spalled and eroded. The deterioration appears to have occurred in horizontal lines (refer to the overview photograph and photograph 3, page C-2).

The masonry and concrete non-overflow wall north of the overflow section appears to be in fair condition with some minor cracking near the south end of the wall. None of the cracks appear to be more than 0.05 of an inch wide. The north end of the wall ties into an earth embankment which has an irregular top width, steep side slopes (varies 1H:1V) varying crest elevation and many large trees (up to 24-inch trunks and 50 feet high) growing on both the slopes and the crest.

The south abutment and the base of the Ogee spillway section appear to tie into bedrock. The north side of the spillway also appears to tie into bedrock; however, seepage (5 gpm) with iron oxide discoloration was noted in this area.

c. Appurtenant Structures. A 4-foot square timber sluiceway through the base of the spillway reportedly has been blocked off with concrete since the site was abandoned in 1921 by the Conway Electric Company. No evidence of a control system for the sluiceway could be found except for an estimated 8-inch diameter steel pipe filled with concrete projecting about 6 inches above the crest of the spillway located in the region where the sluiceway reportedly passes through the base of the dam. This possibly could have been a conduit for a valve control stem.

The stone masonry headworks for the penstock to the power plant, which are in disrepair, are located approximately 150 feet north of the Ogee spillway section of the dam. The reservoir in this area is almost entirely filled with sediment.

The penstock terminates about 20 feet upstream of the remains of the powerhouse which is located about 300 feet downstream of the axis of the dam. The exposed portion of the penstock exhibits considerable corrosion. A small amount of leakage (less than 1 gpm) was observed discharging from the penstock. The only part of the powerhouse which remains is the stone foundation.

SECTION 2

ENGINEERING DATA

2.1 Design

Prints of the original plans and specifications from 1897 for Conway Electric Dam were provided by Mr. John R. Moseley, Clerk of the Courts, County of Franklin Greenfield, Massachusetts. No information is available relative to the modifications made to the dam about 1910.

2.2 Construction

No information with respect to the original construction in 1898 or the modifications of 1910 is available.

2.3 Operation

According to the Owner's representative, no operational data is available for this site.

2.4 Evaluation

a. Availability. Information with regard to Conway Electric Dam was provided by the Commonwealth of Massachusetts Department of Environmental Quality Engineering, Division of Waterway and the Department of Environmental Management (the Owner). Mr. John R. Moseley, Clerk of the Courts, County of Franklin, Greenfield, Massachusetts provided prints of the original 1897 plans and specifications plus added historical information.

b. Adequacy. Information obtained during the field investigation, from conversations with the Owner's representative and from the sources discussed in paragraph 2.4.a, is considered adequate for a Phase I assessment of the dam.

c. Validity. The information provided by the sources discussed in paragraphs 2.4.a and 2.4.b, appears to be valid.

- | | |
|--------------------|---|
| 3. Height | ±77 feet |
| 4. Top Width | 2 to 4 feet overflow portion
10 to 30 feet non-overflow portion |
| 5. Side Slopes | Overflow portion:
Upstream vertical
Downstream approximately 0.3:1
Non-overflow portions:
Upstream and downstream slopes vary 1:1 |
| 6. Zoning | Unknown |
| 7. Impervious Core | Unknown |
| 8. Cutoff | Unknown |
| 9. Grout Curtain | Unknown |

h. Diversion and Regulating Tunnel. Penstock to powerhouse in poor condition and non-functional.

i. Spillway.

- | | |
|-----------------------|----------------------------|
| 1. Type | Concrete Ogee in disrepair |
| 2. Length | ±110 feet |
| 3. Crest Elevation | ±298 |
| 4. Gates | None |
| 5. Upstream Channel | None |
| 6. Downstream Channel | South River |

j. Regulating Outlets.

- | | |
|----------------------|--|
| 1. Invert Elevation | ±225 |
| 2. Size | 4-foot square |
| 3. Description | Sluiceway through base of spillway section |
| 4. Control Mechanism | Unknown
Inoperable since 1921 |

8. Total Project Discharge at Top of Dam. The total project discharge at top of dam El. 305 is 6,650 cfs.

9. Total Project Discharge at Test Flood Elevation. The total project discharge at test flood El. 314 is 26,800 cfs.

c. Elevation. (NGVD)

1. Streambed at Toe of Dam	+228
2. Bottom of Cutoff	Unknown
3. Maximum Tailwater	Unknown
4. Normal Pool	+298
5. Full Flood Control Pool	N/A
6. Spillway Crest (Ungated)	+298
7. Design Surge (Original Design)	Unknown
8. Top of Dam (North Abutment)	+305
9. Test Flood Surge	+314

d. Reservoir Length. (Feet)

1. Normal Pool	+900
2. Flood Control Pool	N/A
3. Spillway Crest Pool	+900
4. Top of Dam	+3,700
5. Test Flood Pool	+4,000

e. Storage. (Acre-feet)

1. Normal Pool	8
2. Flood Control Pool	N/A
3. Spillway Crest Pool	8
4. Top of Dam (North Abutment)	118
5. Test Flood Pool	295

f. Reservoir Surface. (Acres)

1. Normal Pool	5
2. Flood Control Pool	N/A
3. Spillway Crest Pool	5
4. Top of Dam	18
5. Test Flood Pool	22

g. Dam.

1. Type	Overflow portion: rock filled timber crib covered with concrete: non-over flow portion: concrete and masonry wall plus earth embankment.
2. Length	+110-foot overflow portion +155-foot non-overflow portion Total length +265 Feet

h. Design and Construction History. The original dam was designed in 1897 to provide a reservoir for power generation for the Conway Electric Street Railway Company (CESRC). The Franklin County Commissioners approved the plans and specifications submitted by Emery Brown and others of the CESRC for the building of the dam in Conway on October 19, 1897. The dam was a rock filled timber crib structure with plank facing when originally built in 1898. It was about 55 feet high, 90 feet long at the crest and had a 4-foot square timber sluiceway at its base. Flow to the sluiceway was controlled by a timber seating head gate.

The stone masonry headworks for the powerhouse penstock were built about 150 feet north of the dam. The powerhouse was built approximately 200 feet downstream of the dam.

Around 1910, concrete was placed over the existing structure and the crest of the overflow section was raised about 15 feet. A concrete and masonry wall approximately 55 long was built north of the now 110-foot long spillway. The wall, which extends 7 feet above the spillway crest, was tied into an earth embankment roughly 100 feet long which in turn was blended into the north abutment.

In 1921 CESRC abandoned the site. Reportedly at this time the sluiceway was blocked with concrete. Since 1921 the structure has been allowed to slowly fall into disrepair.

i. Normal Operating Procedures. According to the Owner's representative, Mr. Roger Ward, there are no operating procedures associated with this site.

1.3 Pertinent Data

a. Drainage Area. The area draining to the Conway Electric Dam encompasses 26.1 square miles to the west, southwest of the dam. Hydrologically there are no significant impoundments located upstream of the dam.

b. Discharge at Damsite.

1. Outlet Works. No outlet works exist on this site.
2. Maximum Known Flood. According to the Owner's representative, no known discharge records for the site exist.
3. Ungated Spillway Capacity at Top of Dam. The ungated spillway capacity at top of dam El. 305 is 6,650 cfs.
4. Ungated Spillway Capacity at Test Flood Elevation. The ungated spillway capacity at test flood El. 314 is 22,500 cfs.
5. Gated Spillway Capacity at Normal Pool Elevations. Not applicable.
6. Gated Spillway Capacity at Test Flood Elevation. Not applicable.
7. Total Spillway Capacity at Test Flood Elevation. The total spillway capacity at test flood El. 314 is 22,500 cfs.

b. Description of Dam and Appurtenances. The spillway portion of Conway Electric Dam is a concrete section built over a timber crib. The length of the spillway weir is about 110 feet and the overall height of the structure including a 7-foot masonry and concrete wall extending above the spillway on the north side of the spillway is approximately 77 feet. The wall, about 55 feet long, ties into an earth embankment roughly 100 feet long with side slopes averaging about 1:1, which in turn blends into the north abutment. The earth embankment crest varies from 7 feet above the spillway crest to about 17 feet above the spillway at the north abutment. The spillway on the south ties into a steep bedrock abutment.

The spillway is a severely damaged Ogee section (refer to pictures 3 and 4 in Appendix C). A 4-foot square, timber sluiceway is located at the base of the spillway and reportedly had a timber seating head gate.

About 150 feet north of the spillway are stone masonry headworks for the penstock to the power plant abandoned in 1921. All that remains of the powerhouse is the stone foundation.

c. Size Classification. Conway Electric Dam has a maximum height of about 77 feet which places it in the "Intermediate" size classification. The maximum storage capacity of 188 acre-feet is less than the 1,000 acre-foot upper limit for "Small" size dams. Because of its height, Conway Electric Dam is classified in the "Intermediate" size category.

d. Hazard Classification. The initial potential hazard area is considered to be the Stillwater Bridge over the Deerfield River approximately 2.5 miles downstream of Conway Electric Dam. Although the bridge deck would be about 26 feet above the flow caused by breach of the dam, appreciable damage could occur to the bridge supports. A secondary potential hazard area is a cluster of houses about 4 miles downstream from the dam in the vicinity of the Deerfield River. The door sill at the lowest house is roughly 8 feet above the Deerfield River channel banks. The failure analysis indicates that a breach of the dam would result in a depth of flow one foot below the channel banks. Therefore, no loss of life would be expected.

Due to the above considerations, Conway Electric Dam is classified in the "Significant" hazard potential category.

e. Ownership. The dam has been owned by the Commonwealth of Massachusetts, Department of Environmental Management, 100 Cambridge Street, Boston, MA 02114 since 1966. Telephone (413) 549-1461 (Amherst Office).

f. Operator. Owner.

g. Purpose of Dam. The dam was originally constructed in 1898 to impound a water supply for hydroelectric power. The powerhouse was abandoned in 1921 and since then the area has been used for recreation. Most of the reservoir is now filled with silt. The possibility exists that the dam may be used again in the future in a hydroelectric power project. Refer to pages B-20 and B-21.

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
CONWAY ELECTRIC DAM

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. The National Dam Inspection Act (Public Law 92-367) was passed by Congress on August 8, 1972. Under this Act, the Secretary of the Army was authorized to initiate, through the Corps of Engineers, the National Program for Inspection of Dams throughout the United States. Responsibility for supervising inspection of dams in the New England Region has been assigned to the New England Division of the Army Corps of Engineers.

O'Brien & Gere Engineers, Inc. has been retained by the New England Division to inspect and report on selected non-federal dams in the Commonwealth of Massachusetts. Authorization and Notice to Proceed were issued to O'Brien & Gere by a letter dated November 12, 1980 and signed by Col. William E. Hodgson, Jr. Contract No. DACW 33-81-C-0016 has been assigned by the Corps of Engineers for this work.

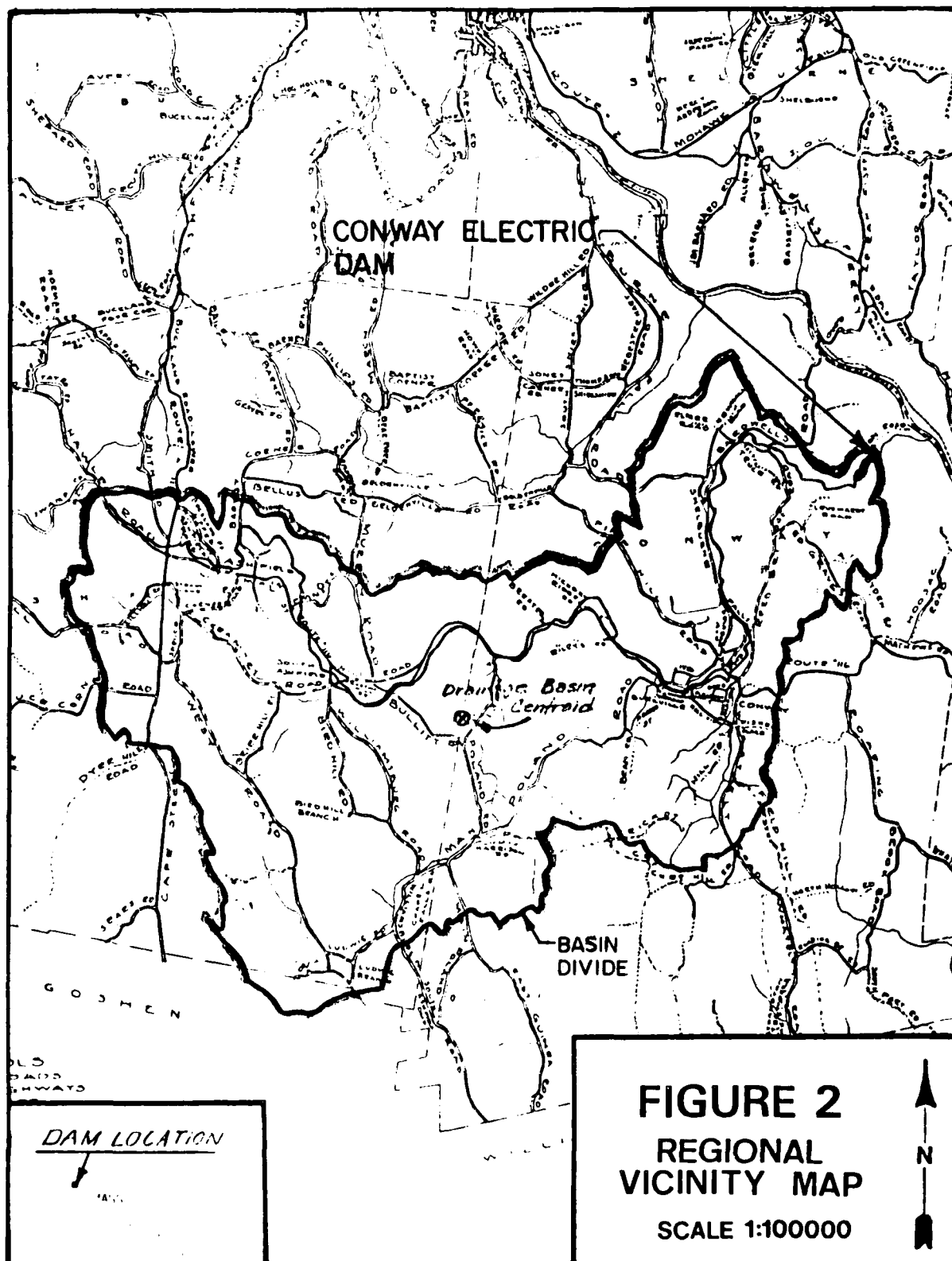
b. Purpose of Inspection. The purpose of inspecting and evaluating non-federal dams is to:

1. Identify conditions which threaten public safety and make the Owner aware of any deficiencies so that he may correct them in a timely manner.
2. Encourage and prepare the State to initiate an effective dam safety program for non-federal dams as soon as possible.
3. Update, verify and complete the National Inventory of Dams.

1.2 Description of Project. (Information with regard to the Conway Electric Dam was provided by the Commonwealth of Massachusetts, Department of Environmental Management and the Clerk of the Courts, County of Franklin, Greenfield, Massachusetts).

a. Location. Conway Electric Dam is located on South River in the Town of Conway, Massachusetts. A portion of the USGS Quadrangle Map entitled "Shelburne Falls, Massachusetts" has been included as Figure 1 on page vi of this report to illustrate the location. USGS reference coordinates for this dam are N42°32.3', W72°40.1'.

Water flowing over the spillway at Conway Electric Dam is conveyed easterly via South River approximately 3,500 feet to the Deerfield River. About 2.5 miles downstream of Conway Electric Dam, the Deerfield River flows under the Stillwater Bridge which would be the initial flood impact site. A secondary potential hazard area would be a cluster of houses in the vicinity of the Deerfield River approximately 4 miles downstream of the dam. The Deerfield River discharges into the Connecticut River about 11 miles downstream of the dam.



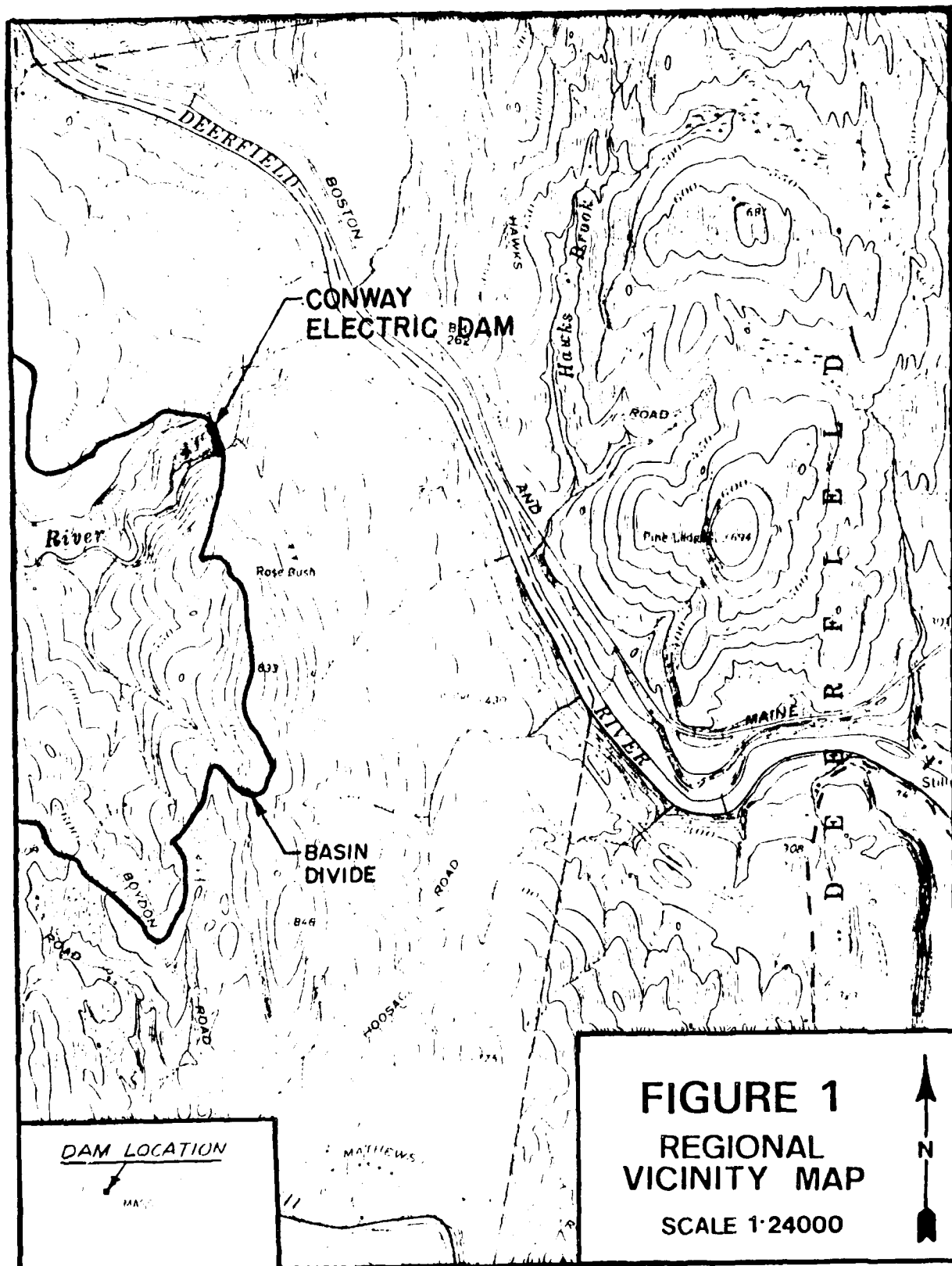


FIGURE 1
REGIONAL
VICINITY MAP
SCALE 1:24000

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. Based upon the visual inspection of December 2, 1980, Conway Electric Dam appears to be in poor condition. Even with the limited visibility of the Ogee spillway overflow portion of the dam, evidence of severe spalling and erosion is apparent. The masonry and concrete non-overflow wall north of the overflow section appears to be in fair condition with some minor cracking near the south end of the wall. The earth embankment north of the wall is in poor condition with many large trees, varying crest elevation, steep side slopes and irregular top width. Seepage (5 gpm) is evident along the north side of the spillway. Structural deficiencies are further discussed in Sections 3 and 6. The lack of a drawdown system is discussed in Section 3. The spillway, in addition to being in poor condition, is hydraulically inadequate.

b. Adequacy of Information. Information obtained during the field investigation, from conversations with the Owner's representative and from the sources discussed in paragraph 2.4.a, is considered adequate for a Phase I assessment of the dam.

c. Urgency. The recommendations and remedial measures described in Sections 7.2 and 7.3 should be implemented within one year of receipt of this Phase I Inspection Report.

7.2 Recommendations

It is recommended that the Owner retain the services of a qualified, registered professional engineer experienced in the design and construction of dams for the following purposes:

1. Inspect the dam during a low or no flow condition and recommend measures to be taken to insure the future integrity of the dam.
2. Design and direct the installation of a reservoir drawdown system.
3. Perform detailed hydrologic and hydraulic analyses to assess the need for increasing the project discharge capacity and to evaluate the ability of the structure to withstand overtopping.
4. Investigate the source and nature of the seepage observed along the north side of the spillway.
5. Direct the removal of all trees and their root systems from the embankment portion of the dam including a 20-foot wide strip beyond the downstream toe of the embankment and direct the backfilling of any remaining voids with suitable, thoroughly compacted material.

7.3 Remedial Measures

a. Operation and Maintenance Procedures. The Owner should also implement the following operation and maintenance procedures:

1. Remove brush from the earth embankment portion of the dam.
2. Establish and maintain vegetative cover on the embankment portion of the dam.
3. Institute a program of annual technical inspection of the dam.
4. Establish and implement a regular maintenance program of the dam.
5. Develop a downstream warning system.

7.4 Alternatives

As an alternative to the above recommendations and remedial measures, the lake could be drained and the dam removed.

APPENDIX A
INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST

INSPECTION TEAM ORGANIZATION

Project: Conway Electric Dam
National I.D.#: MA 00463
Location: Conway, Massachusetts
Type of Dam: Rock Filled Cribbs with Plank Facing Covered with Concrete
Inspection Date(s): December 2, 1980 Limited Embankment Left of spillway
Weather: Cool, Heavily Overcast $\approx 50^{\circ}\text{F}$
Pool Elevation: ± 298 MSL

Inspection Team

Lee DeHeer	O'Brien & Gere	Managing Engineer
Leonard Beck	O'Brien & Gere	Structures
Steven Snider	O'Brien & Gere	Foundations & Materials
Alan Hanscom	O'Brien & Gere	Structures
Denis Mehu	Bryant & Associates	Hydrology/Hydraulics

Owner's Representative

Mr. Carroll Holmes, Regional Supervisor, Dept. of Environmental
Management, Commonwealth of Massachusetts
Mr. Roger Ward, Maintenance Supervisor, Dept. of Environmental Management,
Commonwealth of Massachusetts

VISUAL INSPECTION CHECK LIST

Project: Conway Electric Dam

National I.D. #: MA 00463

Date(s): Dec 2, 1980

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u>	
Crest Elevation	≈ 305 @ Spillway to ≈ 315 @ Left Abutment
Current Pool Elevation	≈ 298.2
Maximum Impoundment to Date	Unknown
Surface Cracks	None Observed
Pavement Condition	Not Applicable
Movement or Settlement of Crest	None Observed
Lateral Movement	None Observed
Vertical Alignment	Varies @ least 10' from El. ≈ 305 @ the spillway to El. ≈ 315 @ left abutment
Horizontal Alignment	Appears satisfactory
Condition at Abutment and at Concrete Structures	Some seepage (≈ 5 gpm) through left abutment. Iron Oxide stains
Indications of Movements of Structural Items on Slopes	None observed
Trespassing on Slopes	Paths are not in evidence on the slopes
Vegetation on Slopes	Heavy tree cover
Sloughing or Erosion of Slopes or Abutments	None observed
Rock Slope Protection - Riprap Failures	None

VISUAL INSPECTION CHECK LIST

Project: Conway Electric Dam

National I.D. #: MA 00463

Date(s): Dec 2, 1980

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT (Con't)</u>	
Unusual Movement or Cracking at or near Toes	<i>None Observed</i>
Unusual Embankment or Downstream Seepage	<i>~5 gpm through left abutment Iron oxide stains</i>
Piping or Boils	<i>None observed</i>
Foundation Drainage Features	<i>None known to exist</i>
Toe Drains	<i>None known to exist</i>
Instrumentation System	<i>None known to exist</i>

VISUAL INSPECTION CHECK LIST

Project: Gravial Electric Dam

National I.D. #: MA 00463

Date(s): Dec 2, 1980

AREA EVALUATED	CONDITIONS
<u>CONCRETE/MASONRY DAM</u>	
Crest Elevation	≈ 296
Current Pool Elevation	≈ 298.2
Maximum Impoundment to Date	UNKNOWN
Any Noticeable Seepage	≈ 5 gpm to left of masonry portion of dam. Same seepage noted on pgs. A-2 & A-3
Conditions of Abutments	Rt. abutment appears to be firm bedrock. Left abutment some weathering of rock with seepage noted above. No drains were observed.
Drains	
Water Passages	Sluiceway outlet was observed at the base of the masonry dam at approx. mid pt. Sluiceway verified in previous rpts. & 1897 dwgs.
Foundation	Appears to be firm bedrock
Masonry/Concrete Surface Cracks	the concrete surface of the dam is severely cracked & spoiled.
Structural Cracking	The above mentioned cracks may extend to the crib dam inside the structure since ≈ 1910 . Refer to pictures 3 & 4 in App. C.
Vertical and Horizontal Alignment	Very poor because of displaced concrete. Refer to above mentioned pictures.
Monolith Joints	None observed in masonry spillway portion of dam (under water). Joints in masonry abutment (North) show no signs of leakage.
Construction Joints	
Upstream Embankment	None observed. According to 1897 drawings there is no upstream embankment.
Instrumentation System	None observed; none known to exist
Inspection Galleries	

VISUAL INSPECTION CHECK LIST

Project: Conway Electric Dam

National I.D. #: MA 00463

Date(s): Dec 2, 1980

AREA EVALUATED	CONDITIONS
<p><u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u></p> <p>a. Approach Channel</p> <p>General Condition</p> <p>Loose Rock Overhanging Channel</p> <p>Trees Overhanging Channel</p> <p>Floor of Approach Channel</p> <p>b. Weir and Training Walls</p> <p>General Condition of Concrete</p> <p>Rust or Staining</p> <p>Spalling</p> <p>Any Visible Reinforcing</p> <p>Any Seepage or Efflorescence</p> <p>Drain Holes</p> <p>c. Discharge Channel</p> <p>General Condition</p>	<p>NONE EXISTS</p> <p>Very poor, extensive cracking & spalling</p> <p>None observed, probably no reinforcing in concrete</p> <p>Extensive, large sections of the spillway crest gone.</p> <p>No</p> <p>Could not be determined under flowing water</p> <p>None observed</p> <p>Boulder filled; refer to picture 9, Appendix C.</p>

VISUAL INSPECTION CHECK LIST

Project: Conway Electric Dam

National I.D. #: MA 00463

Date(s): Dec 2, 1980

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS (Con't)	
Loose Rock Overhanging Channel	<i>A limited amount</i>
Trees Overhanging Channel	<i>Many</i>
Floor of Channel	<i>Filled with boulders up to 10' in size. Gradient \approx 5%</i>
Other Obstructions	<i>None observed</i>

APPENDIX B
ENGINEERING DATA

CONWAY ELECTRIC DAM

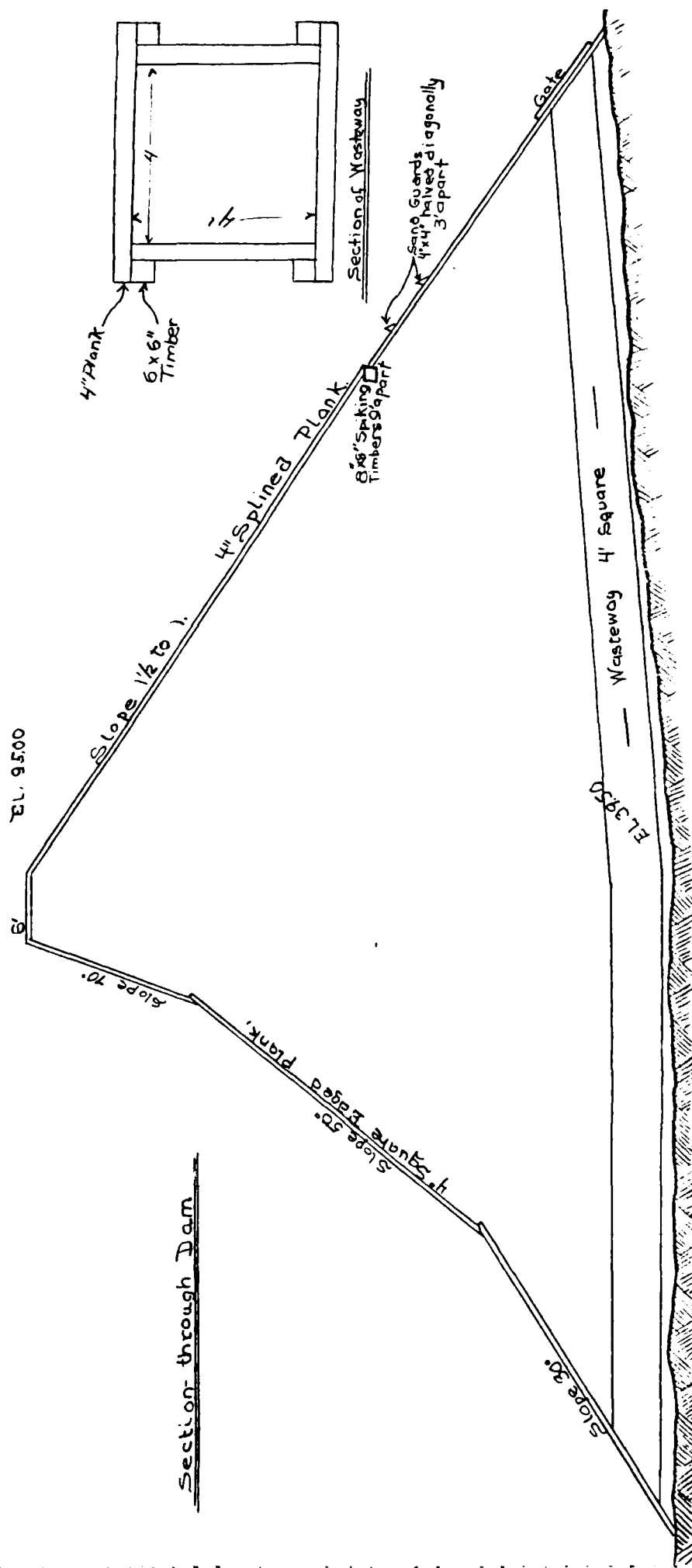
APPENDIX B

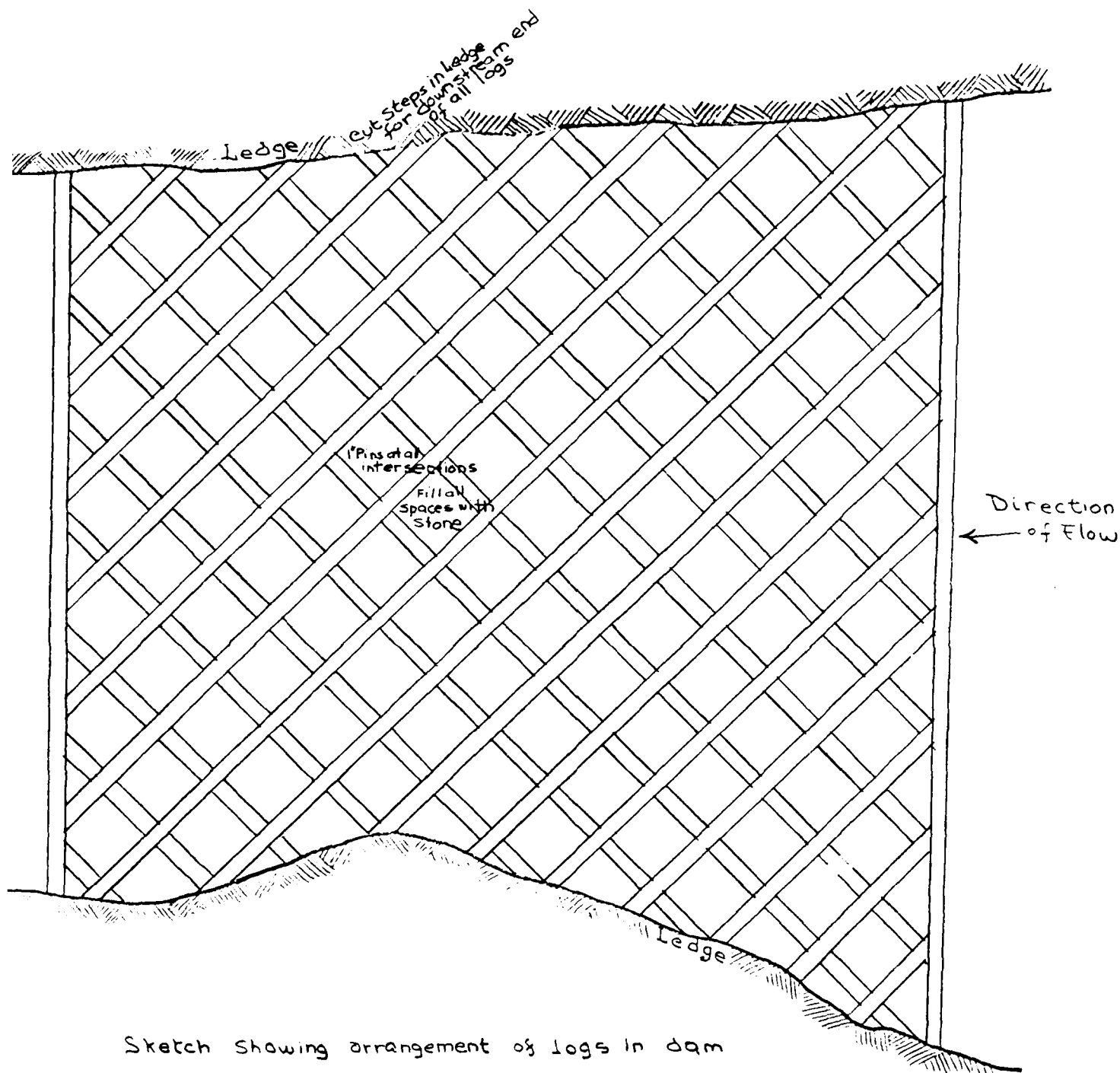
ENGINEERING DATA

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Newspaper Article "Conway Dam Study Proposed", 12/4/80	B-20
Newspaper Article "Conway Hydro Could Mean Big Bucks", 12/17/80	B-21

ORIGINAL DRAWING FROM 1897





Sketch showing arrangement of logs in dam

Typical Section Through Dam

ORIGINAL DRAWING FROM 1897

⑥ OUTLETS: OUTLET CONTROLS AND DRAWDOWN

Main spillway-conc. crest over flow spillway 110'± W. x 7'± H.
 No. 1 Location and Type: with ogee dropwall 65'± H.

2" steel pipe sockets one foot on center along crest
 Controls Yes, TYPE: of spillway-unusable now

Automatic . Manual X. Operative Yes , No X.

Comments: Concrete crest badly spalled.

No. 2 Location and Type: Center bottom of dropwall-4'x 4' sluiceway.

Controls Unk., Type: No controls visible.

Automatic . Manual Unk.. Operative Yes , No X.

Comments: See inspection report of July 30, 1973.

150'± northerly of spillway-stone masonry head works
 No. 3 Location and Type: for 5' diam. penstock.

Controls Yes, Type: Old wood slidegate guides showing above water line.

Automatic . Manual X. Operative Yes , No X.

Comments: 6" x 8" wood timbers rotten-considerable seepage and leaks noted
 in old penstock flume.

Drawdown present Yes X, No . Operative Yes , No X.

Comments: Sluiceway plugged with concrete? See 1973 inspection report.

⑦ DAM UPSTREAM FACE: Slope Vertical. Depth Water at Dam 2' to 12'.

Material: Turf . Brush & Trees . Rock Fill . Concrete . Masonry X. Wood

Other .

Condition: 1. Good . 3. Major Repairs .

2. Minor Repairs X. 4. Urgent Repairs .

Comments: Minor spalling of concrete-pond area mostly silted in water depth

quite shallow 30' to 40' upstream from dam.

⑧ DAM DOWNSTREAM FACE: Slope ogee dropwall.

Material: Turf . Brush & Trees . Rock Fill . Concrete . Masonry X. Wood

Other .

Condition: 1. Good . 3. Major Repairs X.

2. Minor Repairs . 4. Urgent Repairs .

Comments: Severe spalling of lip of spillway-spalling noted on face of dropwall

seepage flows noted in ledge fissures in abutments.

INSPECTION REPORT - DAMS AND RESERVOIRS

1. LOCATION:

City/Town Conway . County Franklin . Dam No. 2-6-68-1

Name of Dam Conway Electric Dam
Mass. Rect.

Topo Sheet No. 10 C . Coordinates: N 563,000 , E 285,300 .

Inspected by: Harold T. Shumway , On June 14, 1977 . Date
Last Inspection 8-22-75

2.

OWNER/S: As of June 14, 1977

per: Assessors _____, Reg. of Deeds _____, Prev. Insp. X , Per. Contact _____.

Comm. of Mass.

1. Dept. of Environmental Management, 100 Cambridge St., Boston, Mass.

Name	St. & No.	City/Town	State	Tel. No.

Name	St. & No.	City/Town	State	Tel. No.

Name	St. & No.	City/Town	State	Tel. No.

3.

CARETAKER: (if any) e.g. superintendent, plant manager, appointed by
absentee owner, appointed by multi owners.

Mr. Kenneth Dubuque

Regional Forest Parks Supervisor, Amherst Nursery, P.O. Box 484, Amherst, Mass.

Name	St. & No.	City/Town	State	Tel. No.

4.

DATA:

No. of Pictures Taken None . Sketches See description of Dam.

Plans, Where 1897 sketch on file in County Commissioners office

Approved Oct. 19, 1897.

5.

DEGREE OF HAZARD: (if dam should fail completely)*

1. Minor X .

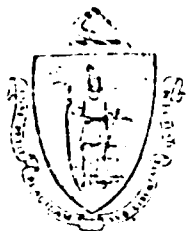
3. Severe _____.

2. Moderate _____.

4. Disastrous _____.

Comments: Damage would be mostly silting of Deerfield River bed.

*This rating may change as land use changes (future development).



The Commonwealth of Massachusetts

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL QUALITY ENGR.
DIVISION OF WATERWAYS

100. Nashua Street, Boston 02114

June 30, 1977

Commonwealth of Massachusetts
Dept. of Environmental Management
100 Cambridge St.
Boston, Mass.

PE: Insp. Dam #2-6-68-1
Conway Electric Dam
Conway

Dear Sir:

On June 14, 1977, an Engineer from the Massachusetts Department of Public Works made a visual inspection of the above dam. Our records indicate the owner to be Comm. of Mass., Dept. Env. Management. If this information is incorrect, will you please notify this office.

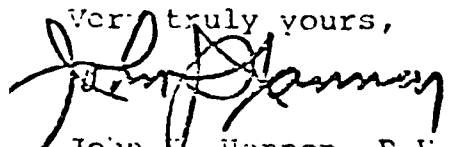
The inspection was made in accordance with the provisions of Chapter 253 of the Massachusetts General Laws as amended (Dams Safety Act). Chapter 706 of the Acts of 1975 transferred the jurisdiction of the so-called "Dams Safety Program" to the Commissioner of the Department of Environmental Quality Engineering.

The results of the inspection indicate that this dam is conditionally safe. The following conditions were noted that require attention:

There is no visible evidence of any repairs having been made to this dam since last inspection of 8-22-75, and structure is continuing to slowly deteriorate. Leaks through old flume pipe developed and seepage and small leaks noted on downstream side of dam appears somewhat more pronounced.

We call these conditions to your attention before they become serious and more expensive to correct. With any correspondence please include the number of the dam as indicated above.

Very truly yours,


John V. Hannon, P.E.
Chief Engineer

WHL: bjm
cc: Kenneth Dubuque
Francis J. Hoey, D.H.E.
H. Shumway, D.D.R.E.

Box 484
Amherst, Mass.

TO: Bruce S. Gullion, Director
FROM: Kenneth M. Dubuque, Regional Supervisor
SUBJECT: INSPECTION DAMS. REGION #4
DATE: December 21, 1973

Conway Electric Dam, Conway

Dam structure in question, Inspector doesn't know whether it is log crib covered with cement or solid cement. Sluiceway not operable.

Penstock condition in question, condition of intake gate uncertain.

Should be thoroughly investigated by qualified Reg. Engineer with a great deal of experience and knowledge on this subject.

*From Commonwealth of Massachusetts, Dept of Environmental
Management files.*

REMARKS AND RECOMMENDATIONS: (Continued)

only conditionally safe.

There is a 4' x 4' square sluiceway through the base of the spillway. A swimmer was able to look into this and reported some water leaking through the sluiceway. No controls were located but there is a six or eight inch steel pipe filled with cement projecting about 10 inches above the crest of spillway. A representative of the Department of Natural Resources told me that just before the dam was abandoned the Conway Electric Company poured concrete to block the sluiceway.

Attachment to Description of Dam

Note Number 1.

In the Franklin County Commissioners Office there is a sketch of a timber crib dam, attached to a petition of the Conway Electric Company, to build a dam at Conway Station on the South River. The Commissioners approved this petition at their meeting of October 19, 1897. This sketch is for a log crib dam, 90 feet long and 55.5 \pm feet high.

No record of later alteration was found but hearsay indicates that around 1910 a masonry structure was built.

RCS/sd

DAM NO. 2-6-68-1

**CONWAY ELECTRIC DAM
JULY 30, 1973 INSPECTION**

OVERALL CONDITION:

1. Safe _____.
2. Minor repairs needed _____.
3. Conditionally safe - major repairs needed X _____.
4. Unsafe _____.
5. Reservoir impoundment no longer exists (explain)
Recommend removal from inspection list: _____.

13.

REMARKS AND RECOMMENDATIONS: (Fully Explain)

This old spillway dam has been neglected for many years. There are no operating gates, the only outlet being the main 110'± wide Ogee spillway. As near as can be determined the original log crib dam was built in 1897 to provide power for a trolley line and about 1910 the present masonry dam was built apparently over the older log crib dam.

The southerly end of the Ogee spillway is founded on ledge and at the northerly end ledge outcroppings are visible three quarters of the height of the dam. There is a 4' wide masonry wall 53' long from the end of the spillway's abutment, backed by an earth fill 10 to 20 feet wide. Several trees were growing on the pond side of this wall. Below the dam on the northerly side, there were several leaks or springs flowing from cracks in the ledge.

About 150 feet north of the spillway end are the stone masonry headworks for the old penstock. It was impossible to determine the existing or condition of the intake gate. The 5' diameter boiler plate penstock could be seen on the other side of the narrow ridge extending to the end of the dam. Some water was leaking out but it did not seem to be under any pressure and the penstock lower end at the old power house ruin was open.

The Ogee spillway was about 65' high and the downstream face was deeply spalled and eroded. This deterioration seemed to have occurred in regular horizontal lines and in areas it appeared that logs from the old log crib dam were exposed. It was impractical to view this surface close up and because of the water flowing over the surface a good view was impossible. It does appear that a concrete veneer over the old log face has fallen away and that a close inspection of the face is necessary before a final evaluation can be made. It is possible that if the logs are now exposed that frost and ice action could dislodge them and cause the dam to fail. For this reason the dam has been rated

/sd

RCS/js

(Continued)

Dam No. 2-6-68-1

Classification of Dam by Material:

Earth _____ Conc. Masonry - X Stone Masonry _____

Timber X Rockfill _____ Other _____

See Note No. 1.

Dam Type: Gravity X Straight X Curved, Arched _____ Other _____
Overflow X Non-overflow _____

A. Description of present land usage downstream of dam:

100 % rural; _____ % urban

B. Is there a storage area or flood plain downstream of dam which could accommodate the impoundment in the event of a complete dam failure? Yes X No _____ About 1/2 mile gorge to Deerfield River.

C. Character Downstream Valley: Narrow X Wide _____ Developed _____
Rural 100% Urban _____

Risk to life and property in event of complete failure.

No. of people None

No. of homes None

No. of businesses None

No. of industries None Type _____

No. of utilities None Type _____

Railroads None

Other dams None

Other Possible damage to property on Deerfield River.

See Attached Notes.

Attach Sketch of dam to this form showing section and plan on 8 1/2" x 11" sheet.

RCS/vk/sd

Attachments

Locus Plan

Sketches

B-11

DESCRIPTION OF DAM

DISTRICT III.Submitted by Russell C. Salls, P. E. Dam No. 2-6-68-1Date July 30, 1973 ~~City~~/Town ConwayName of Dam Conway Electric Dam

1. Location: Topo Sheet No. 10C Mass. Rect. Coordinates N 563,000 E 285,300

Provide 8 $\frac{1}{2}$ " x 11" in clear copy of topo map with location of Dam clearly indicated.

Located on South River about one-half mile from its mouth at the Deerfield River and about 300 feet south of Conway Station Road about a mile easterly from Bardwell Road

2. Year built 1897 Year/s of subsequent repairs Unknown
See Attached Note #1

3. Purpose of Dam: Water Supply _____ Recreational X
Flood Control _____ Irrigation _____ Other Originally power source for trolley line

4. Drainage Area: 21 $\frac{1}{2}$ sq. mi. _____ acres.
Type: City, Bus. & Ind. _____ Dense Res. _____ Suburban _____ Rural, Farm 20%
Wood & Scrub Land 80% Slope: Steep 40% Med. 40% Slight 20%

5. Normal Ponding Area: 17 Acres; Ave. Depth 25 \pm 68 515 2
Impoundment: 138 $\frac{1}{2}$ Million gals.; 425 acre ft.
Silted in: Yes _____ No _____ Approx. Amount Storage Area _____
Pond over 98% silted in actual impoundment now about one million gallons.

6. No. and type of dwellings located adjacent to pond or reservoir None
i.e. summer homes etc. _____

7. Dimensions of Dam: Length 110' Max. Height 65'
Freeboard 7'
Slopes: Upstream Face Vertical
Downstream Face Ogee Curve
Width across top Ogee spillway - approximately 2' flat on crest.

B-10

June 3, 1965.

Mr. Bruce Gullion
Director of Forests & Parks
100 Cambridge St.
Boston, Mass.

Dear Mr. Gullion:

Subject: Dams and Reservoirs under control of Department of
Natural Resources

South River-Conway. 2 acres. Average depth 5'. Concrete
structure. 100' spillway, no flash boards. 5' gate for complete drain.
Draw down not necessary.
Maintained by C.C. Annear and A. Sadow.
Apparent condition, good with exception of gate which has not been
freed for many years. This should be repaired for cleaning of
impoundment which is filled with silt.

*From Commonwealth of Massachusetts, Dept of Environmental
Management files*

Franklin, petitioners for the approval of dam across South River, in Conway.

The petition in this case was presented to the Board of County Commissioners at their meeting, held at Greenfield, within and for said County, on the eighteenth day of September A. D. 1897, by adjournment from the first Tuesday of September A. D. 1897.

And said petitioners caused a sufficient recognizance to be given to said County, in the sum of two hundred dollars to pay all costs and expenses which might arise by reason of said petition and the proceedings had thereon in case the same should not prevail; and said petition is in words following, to wit:

Conway, Mass, Sept. 4th 1897.

To the Hon. Board of County Commissioners:-

Gentlemen:- We, the undersigned, desiring to build a dam across South River near Conway Station, respectfully petition your Honorable Board to take such action regarding it as the law requires

E. Brown and others.

And thereupon said petition was continued to the meeting of said Board, held at Greenfield, within and for said County, on the nineteenth day of October A. D. 1897, by adjournment from the first Tuesday of September A. D. 1897.

And at said meeting, it was - Voted: That the plans and specifications submitted by Emery Brown and others for the building of a dam in Conway, be approved.

APPROVAL OF COUNTY COMM. TO BUILD DAM B-8

CONWAY ELECTRIC STREET RAILWAY COMPANY.

CARLOS BATCHELDER, PRESY.
JOHN B. LAIDLEY, SECRETARY.
F. A. DELABARRE, TREAS.
ARTHUR M. COOK, AUDITOR.

CONWAY, MASS., *Sept. 4* 1897

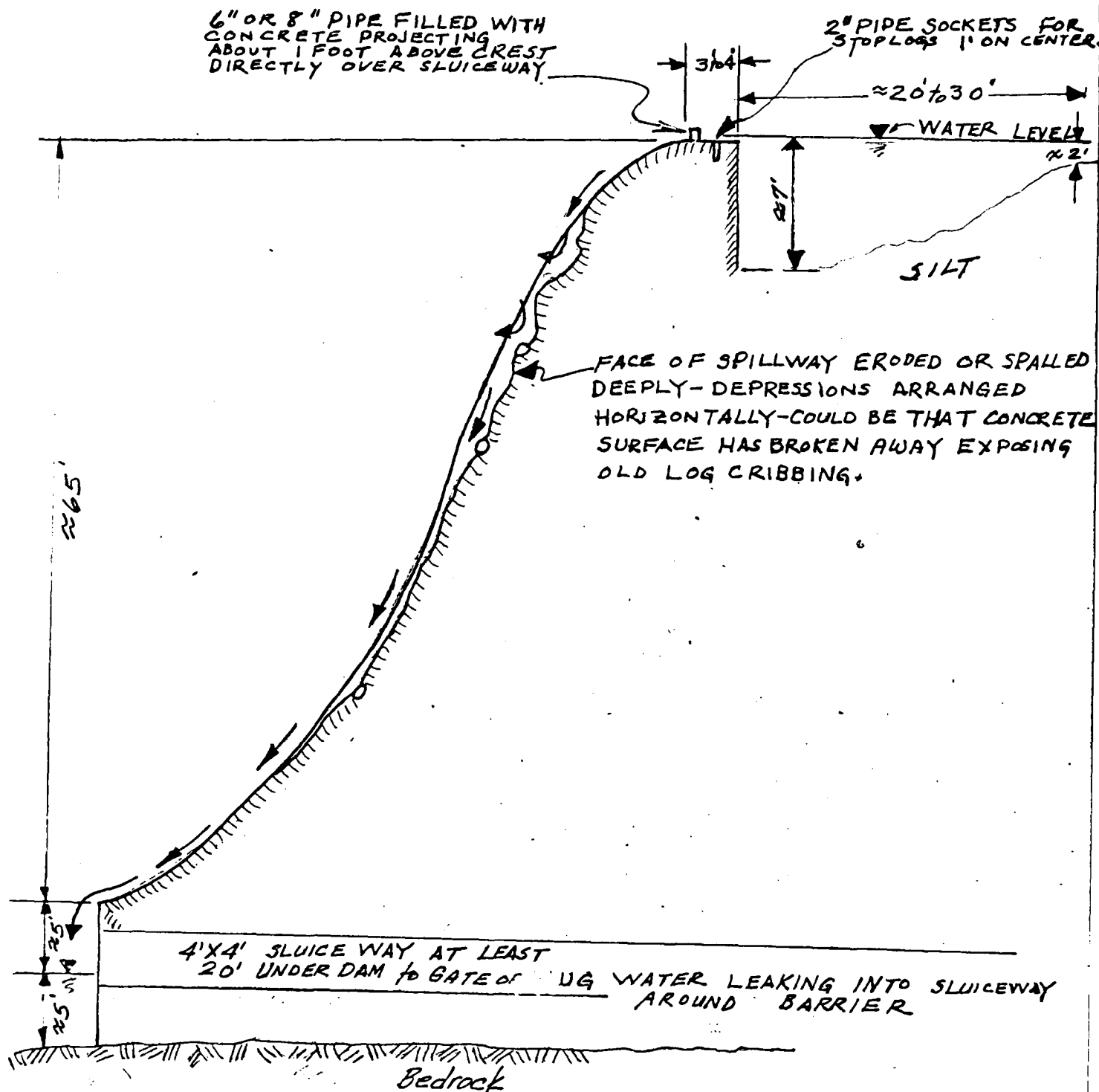
To the Hon. Board of County Commissioners:-
Gentlemen:-

We, the undersigned, desiring to build a dam across South River near Conway Station, respectfully petition your Honorable Board to take such action regarding it as the law requires

E. Bowser
cc. *John B. Laidley*
W. F. Delabare
A. P. Selabane

SKETCHES NOT TO SCALE

DAM NO. 2-6-68-1



SECTION THROUGH CENTER OF
Ogee SPILLWAY @ SLUICEWAY

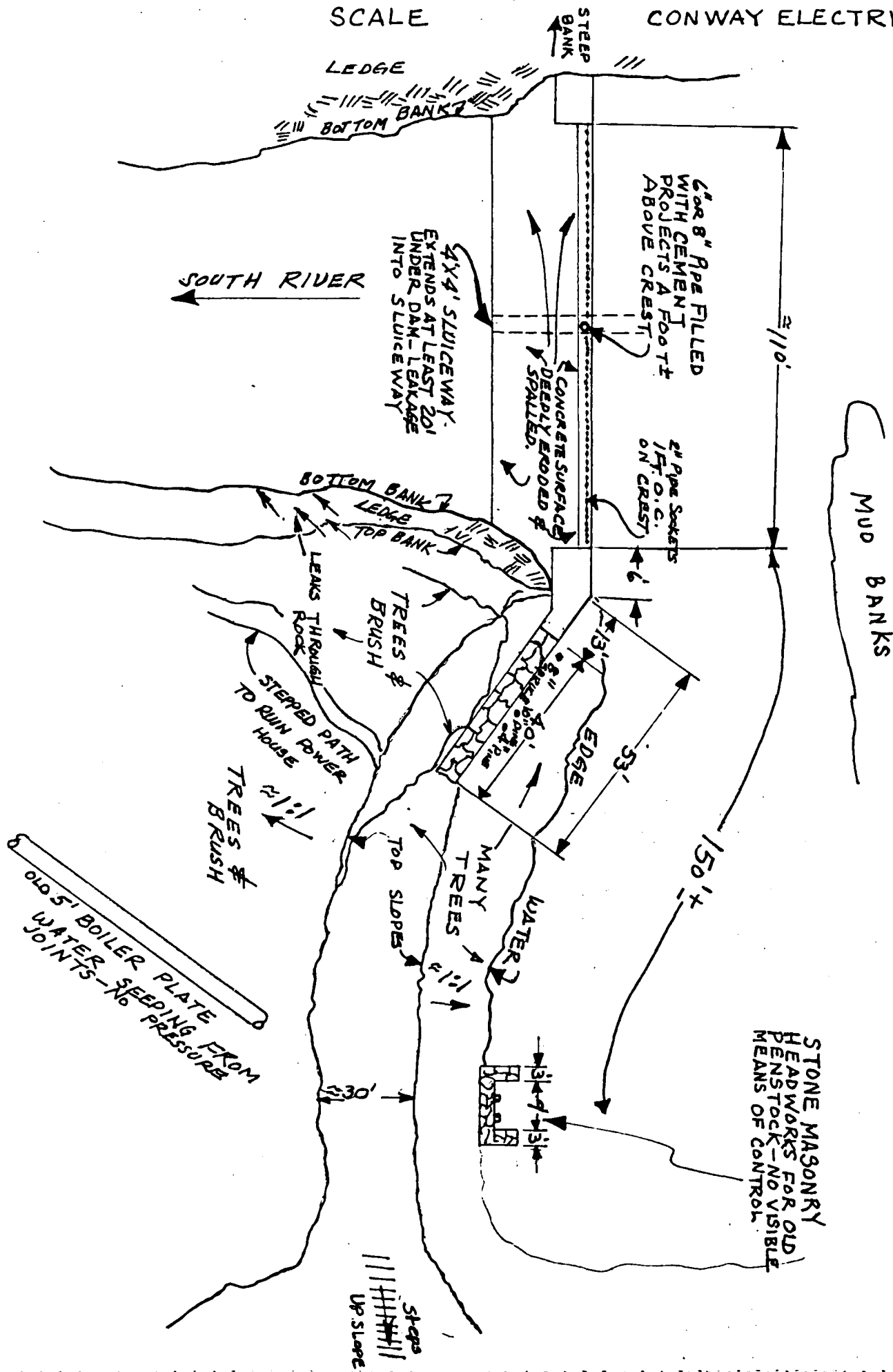
From Commonwealth of Massachusetts, Dept. of Environmental Management files.

B-6

RCS
7/30/73

SKETCHES NOT TO
SCALE

DAM NO 2-6-68-1
CONWAY ELECTRIC



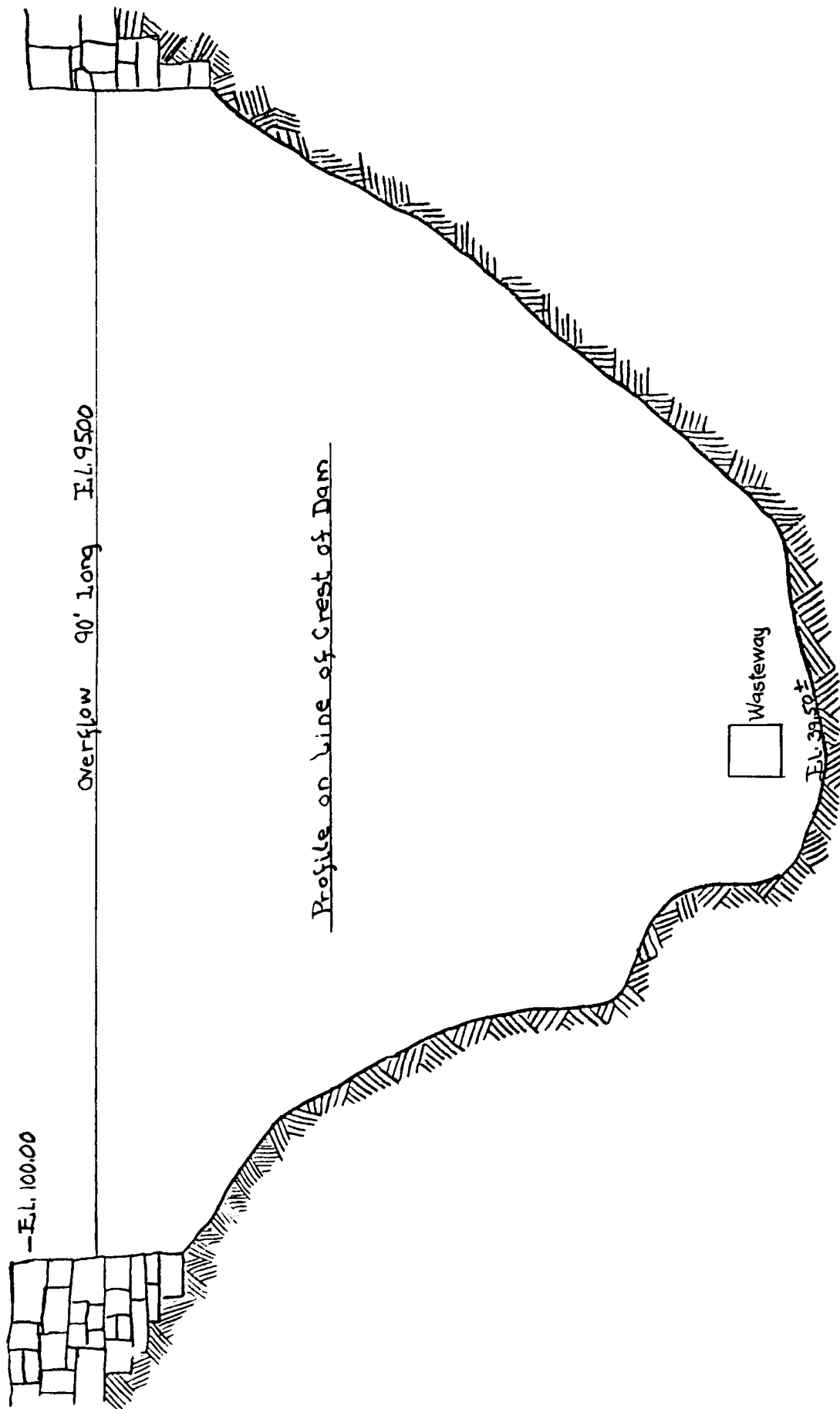
POND

MUD BANKS

STONE MASONRY
HEADWORKS FOR OLD
PENSTOCK - NO VISIBLE
MEANS OF CONTROL

B-5

RPL
July 30, 1973



ORIGINAL DRAWING FROM 1897

9. EMERGENCY SPILLWAY: Available No. Needed No.

Height Above Normal Water Ft.

Width Ft. Height Ft. Material .

Condition: 1. Good . 3. Major Repairs .

2. Minor Repairs . 4. Urgent Repairs .

Comments: Spillway appears to be adequate.

10. WATER LEVEL AT TIME OF INSPECTION: + Ft. Above X . Below .

Top Dam F.L. Principal Spillway X .

Other

Normal Freeboard 7 Ft.

11. SUMMARY OF DEFICIENCIES NOTED:

Brush growth on earthen embankment on
Growth (Trees and Brush) on Embankment northerly end of dam.

Animal Burrows and Washouts None found

Damage to Slopes or Top of Dam Concrete spalling on crest of spillway.

Cracked or Damaged Masonry Spalled concrete noted over entire structure.

Evidence of Seepage Red oxide stains noted at toe of dam in ledge seams

Evidence of Piping None found

Leaks Flows noted in ledge fissures.

Erosion Minor erosion of northerly bank below dam noted.

Trash and/or Debris Impeding Flow None found.

Clogged or Blocked Spillway None found.

Other Small leaks noted in bottom of flume pipe at sharp bend of flume.

12.

OVERALL CONDITION:

1. Safe _____.
2. Minor repairs needed _____.
3. Conditionally safe - major repairs needed X _____.
4. Unsafe _____.
5. Reservoir impoundment no longer exists (explain)
Recommend removal from inspection list _____.

13.

REMARKS AND RECOMMENDATIONS: (Fully Explain)

There is no visible evidence of any repairs having been made to this dam since last inspection of 8-22-75 and structure is *continuing* to slowly deteriorate.

Leaks through old flume pipe developed and seepage and small leaks noted on downstream side of dam appear some what more pronounced. Damage from complete failure of the dam would appear to be mostly from released silt stored behind the dam.

HTS/at

Conway dam study proposed

By TOM MEYERS
Recorder Staff

CONWAY — Hoping to excite residents about the potential use of the old Conway Power Station Dam, the Conway Town Energy Committee is trying to generate as much interest in a proposed hydroelectric project in town as the dam could generate electricity.

The abandoned dam on the South River has the largest generating potential and highest available head — vertical distance from top of dam to bottom — of any untapped site in Franklin County. It could conceivably generate half of Conway's energy needs.

To bring the project closer to reality, the energy committee has requested town residents appropriate \$750 toward a \$22,000 feasibility study of the project at a special town meeting. The meeting is Monday at 8 p.m. at town hall.

In preparation for that vote the energy committee conducted an informational

session Monday for 15 citizens interested in the project. Although town finances are already tight, the energy committee is asking voters to consider the expenditure as an "investment in Conway's energy future." If the dam, abandoned in 1921, is redeveloped, James Manwell, energy committee member, told the group Conway could become the first small town "to do anything vaguely like this."

Lisa Limonte, energy committee chairwoman, said the preliminary study shows "it would make sense to redevelop the dam." The town would lease the site from the owner, the state Department of Environmental Management, and the electricity would be sold to Massachusetts Electric Co.

Ms. Limonte said the dam could generate between \$80,000 and \$100,000 revenue for the town. The town must sell the electricity to the utility unless there is a change in

legislation allowing the town to use the power generated at the dam directly.

Manwell estimated the renovation of the dam would cost \$1 million. He said the top surface of the dam — worn from water pouring over it — appears to be the portion which would need the most work. Other tentative costs include the 500- to 600-kilowatt turbine, \$250,000; redoing the access road off Conway Station Road, \$60,000; and dredging sludge from the old reservoir, \$60,000.

Ms. Limonte said the feasibility study would provide a more detailed estimate of the costs and funding sources. The study would also assess the impact the dam would have on the town and the environment.

Believing the town should play a major role in the development of the dam, the energy committee submitted an application to the state Energy Office for a grant to fund the feasibility study. The grant provides 50 per-

cent of the total cost for the study with the other half coming from the town. However, because several people would work at reduced wages and much of the work has already been undertaken, only \$750 is required from the town.

INSIDE TRACK



FRANKLIN & HAMPSHIRE CO. NEWS

VALLEY Advocate

VOL. VIII NO. 18 DECEMBER 17, 1980

GENERAL INFORMATION

TELEPHONE: Springfield: 1-413-781-1900 (Editorial and Advertising), Amherst: 1-413-549-2700 (Connecting All Departments).

Conway Hydro Could Mean Big Bucks

During World War I, the hydroelectric dam at Conway Station powered an electric railway through the town of Conway. By 1921, the dam was abandoned as other sources of power production became more economic. But the 65-foot dam on the South River remains intact, the largest such undeveloped dam in the county—but perhaps not for much longer. Even today, if rebuilt, the dam could produce enough power to meet one-half of Conway's electricity needs.

Last week a special town meeting voted \$750 towards a \$22,000 feasibility study of the dam. This was a vote of confidence for a group of alternative energy advocates who have dreamed of redeveloping the dam for years. They plan to combine the \$750 in town money with donated skills valued at \$10,285 to come up with the local match for the \$11,000 in state funds. The state Executive Office of Energy Resources has \$1 million to allocate for hydro development, and the funds are expected to be awarded by the first of the year.

Jim Manwell, a Conway native and an engineer, has been doing research on the dam for the past several years. Nearly two years ago, the town formed an energy committee and this group agreed one of its projects would be to investigate the dam. Manwell worked with Lisa Limont, chairwoman of the energy committee, to write the grant proposal for the state, which included estimates of the total development costs (\$500,000 to \$1 million) and a pre-feasibility assessment. Bob Van Gelder and Duane Marcus, graduate students in regional planning and landscape architecture, worked on the environmental impact statement. Barbara Schneider of Whately conducted deed research and prepared engineering drawings. Attorney Michael Pill did legal research on water rights. Even the Department of Environmental Management, which owns the dam site, agreed to the study with the apparent intention of allowing the development if it's feasible.



Town residents hope there's a hydropower plant in Conway Station's future. (Tobey photo)

Limont told the *Advocate* the dam seems in good shape, but one of the main purposes of the study will be to hire structural engineers to make sure the dam is safe. From the top of the dam to the powerhouse below is a drop of 100 feet, and Limont estimated the repaired dam could produce 2,600,000 kilowatt hours of power per year. The power would have to be sold back to Northeast Utilities at a rate yet to be determined.

There are no turbines at Conway Station now and the penstock (the pipe to the power house) will have to be replaced if the project is to be feasible.

Despite the possibility that the development of the site will cost the town additional money in the future, the more than 100 residents at the town meeting supported the proposal. Part of the reason is the town stands to make money on its investment. Depending on the payback rate for the power produced, the town could make from \$100,000 to \$160,000 per year and pay off its initial investment in less than 10 years. Financing schemes for such a proposal could include floating a municipal bond, borrowing at low interest from the Farmers Home Administration or applying for funds through the Economic Development Administration.

Bev Eaton

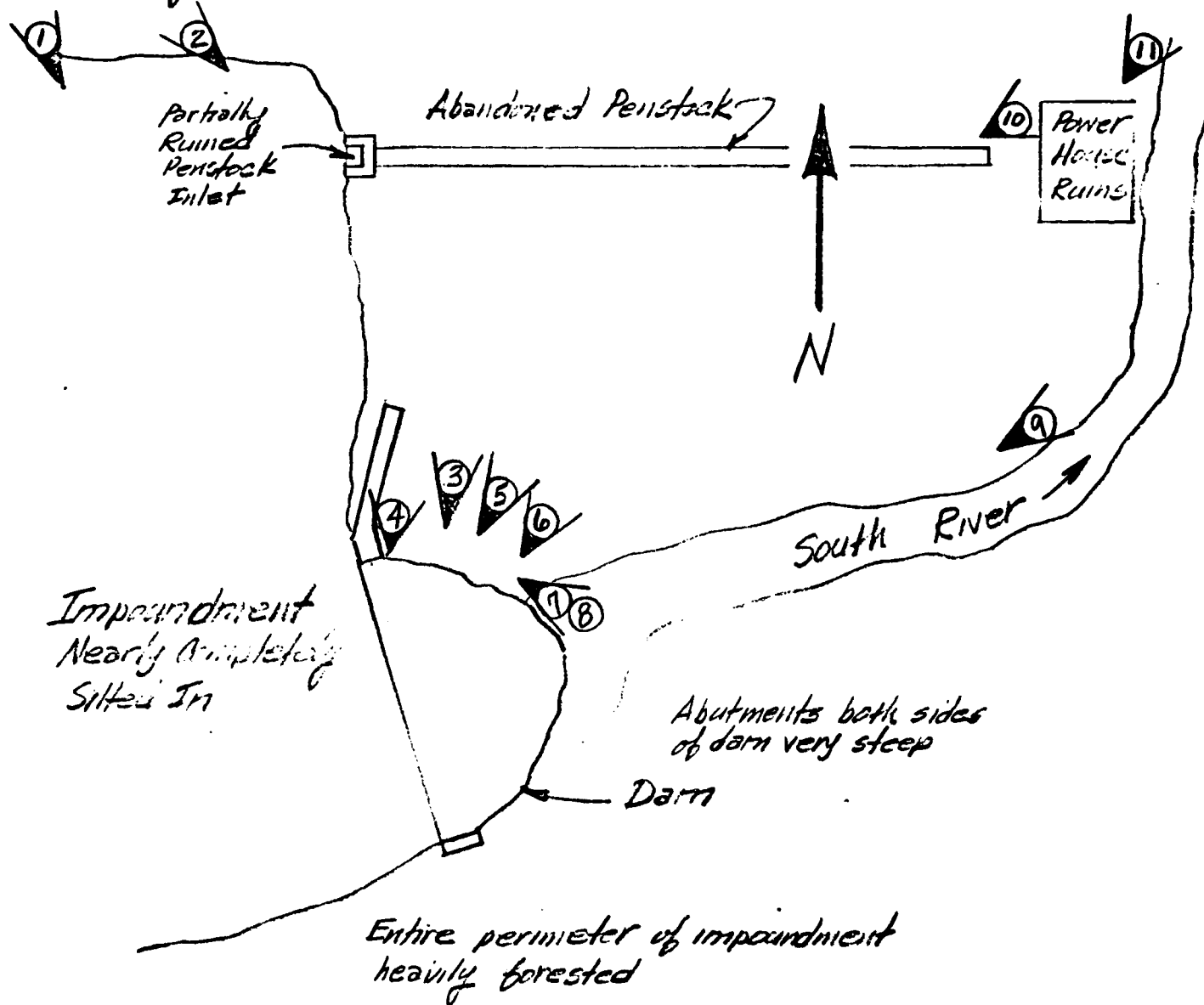
B-21

APPENDIX C
PHOTOGRAPHS

APPENDIX C
SELECTED PHOTOGRAPHS OF THE PROJECT

	<u>Page No.</u>
Site plan showing location and direction in which each photo was taken.	A
 <u>PHOTOGRAPHS</u>	
<u>No.</u>	
1. Silt filled impoundment with penstock entrance on the left and the left abutment of the dam on the right. (12/2/80)	1
2. Partially ruined penstock entrance left of the dam. (12/2/80)	1
3. Crest of spillway viewed from the left abutment. (12/2/80)	2
4. Crest of spillway showing deterioration of the Ogee surface. (12/2/80)	2
5. Downstream overview showing the irregular surface of the downstream face of the dam. (12/2/80)	3
6. The downstream right abutment of the dam. (12/2/80)	3
7. The downstream left abutment of the dam showing areas of seepage. (12/2/80)	4
8. Close-up of one of the seepage areas in the downstream left abutment of the dam. (12/2/80)	4
9. Typical river conditions downstream of the dam. (12/2/80)	5
10. Outlet of the abandoned penstock on the left abutment of the dam. (12/2/80)	5
11. Ruins of powerhouse approximately 100 yds. of the dam. (12/2/80)	6

SUBJECT	CONWAY Electric Co. Dam	SHEET	A	BY	JG	DATE	12/10/80	JOB NO.	2060-002
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SITE PLAN

LEGEND

- ① The location and direction in which each photo was taken and the number of the photo



1. SILT FILLED IMPOUNDMENT WITH PENSTOCK ENTRANCE ON THE LEFT AND THE LEFT ABUTMENT OF THE DAM ON THE RIGHT. (12/2/80)



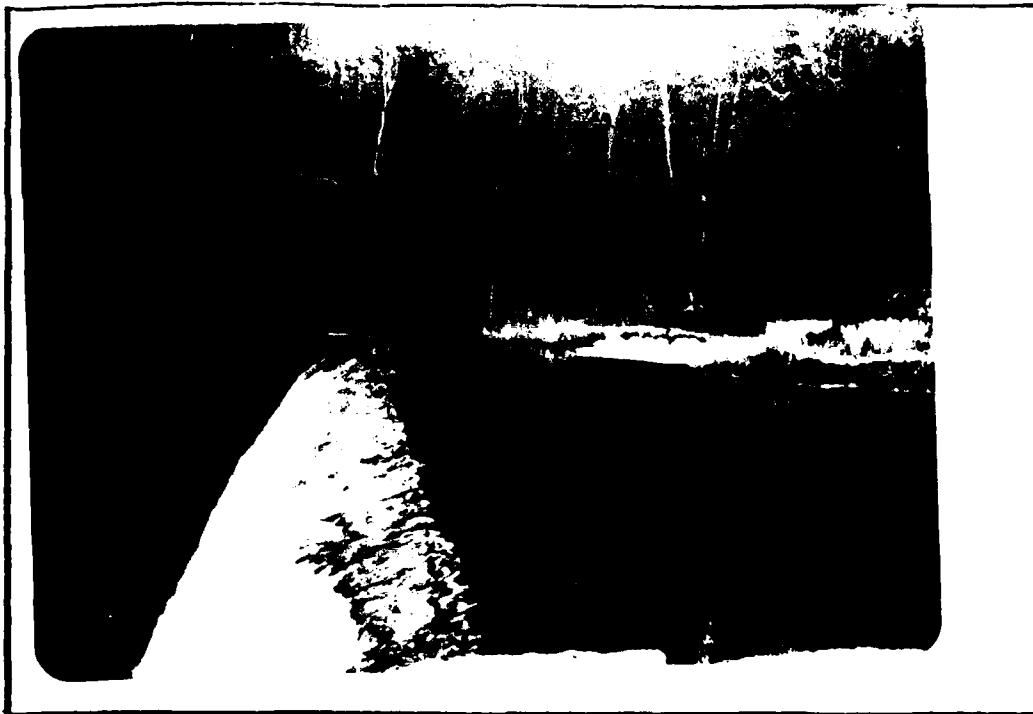
2. PARTIALLY RUINED PENSTOCK ENTRANCE LEFT OF THE DAM. (12/2/80)



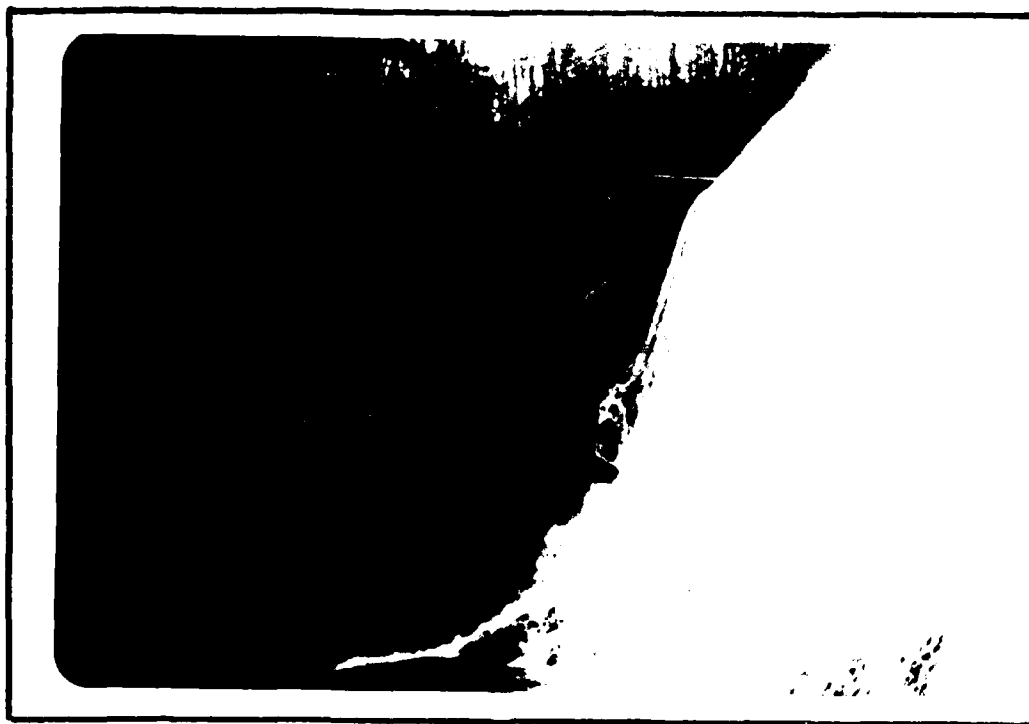
3. CREST OF SPILLWAY VIEWED FROM THE LEFT ABUTMENT. (12/2/80).



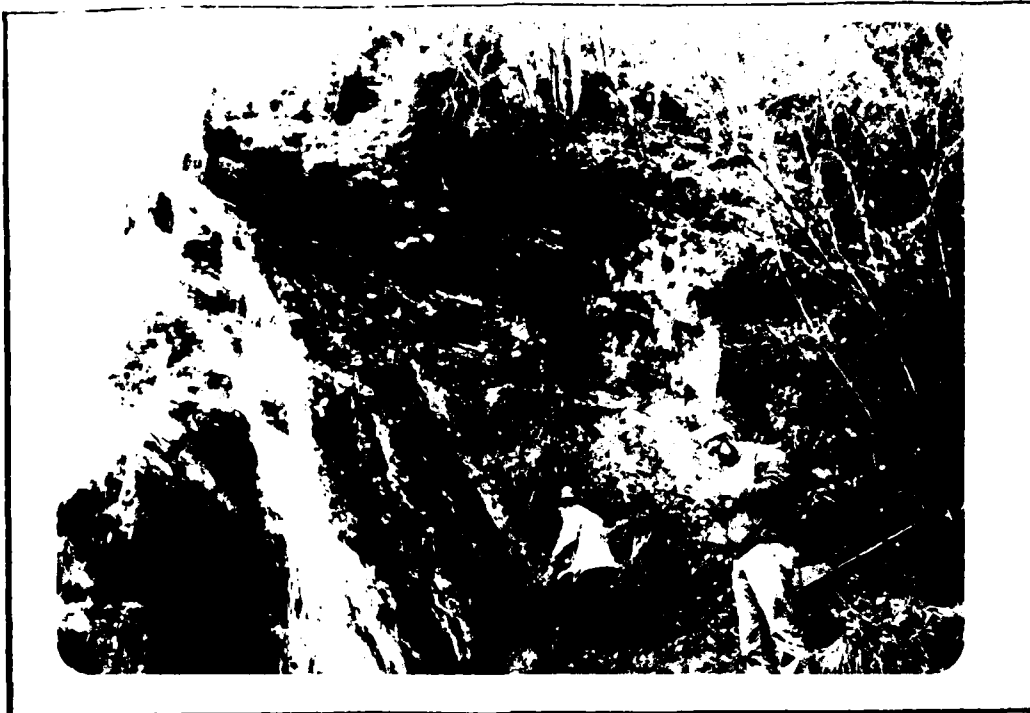
4. CREST OF SPILLWAY
SHOWING DETERIORATION
OF THE OGEE SURFACE.
(12/2/80)



5. DOWNSTREAM OVERVIEW SHOWING THE IRREGULAR SURFACE OF THE
DOWNSTREAM FACE OF THE DAM. (12/2/80)



6. THE DOWNSTREAM RIGHT ABUTMENT OF THE DAM. (12/2/80)



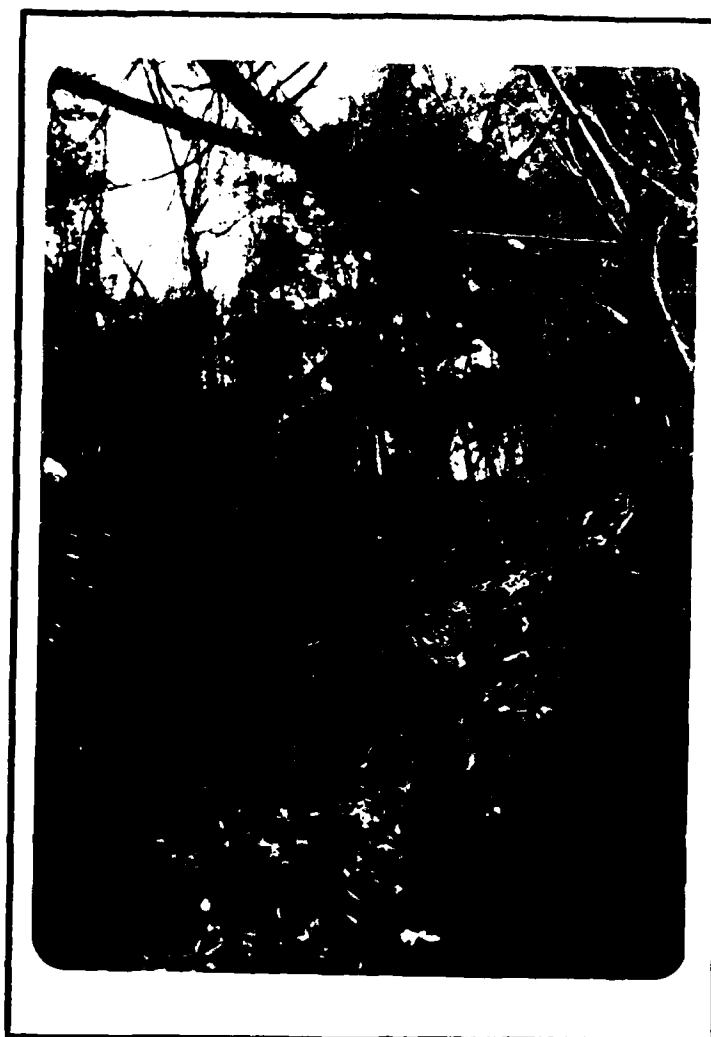
7. THE DOWNSTREAM LEFT ABUTMENT OF THE DAM SHOWING AREAS OF SEEPAGE. (12/2/80)



8. CLOSE-UP OF ONE OF THE SEEPAGE AREAS IN THE DOWNSTREAM LEFT ABUTMENT. (12/2/80)



9. TYPICAL RIVER CONDITIONS DOWNSTREAM OF THE DAM. (12/2/80)



10.
OUTLET OF THE ABANDONED
PENSTOCK ON THE LEFT
ABUTMENT OF THE DAM.
(12/2/80)



11. REMAINS OF POWERHOUSE APPROXIMATELY 100 YARDS DOWNSTREAM
OF THE DAM. (12/2/80)

APPENDIX D
HYDROLOGIC AND HYDRAULIC COMPUTATIONS

WORLDWIDE CHANGING

[illegible]

6089

Account	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362</
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[illegible]

MAXIMUM STAGE IS 179.1

.....

HYDROGRAPH CUTTING

CONWAY ELECTRIC CAN REACH ROUTING TO HAZARD

ISTAG	ICOMP	RECON	ITAPE	JPLT	JFRT	INAME	ISTAGE	AUTO
YEAR42	1	0	0	0	0	1	0	0
ROUTING DATA								
CLGSS	AVG	IPES	ISAME	IOFT	IPMP		LSTR	
0.0	0.00	1	1	0	0		0	
MSTPS	MSTEL	LAG	ANSKK	X	TSK	STORA	ISPRAT	
1	0	0	0.000	0.000	0.000	-1	0	

D-13

100

HYDROLOGIC ANALYSIS OF CONWAY ELECTRIC DAM
NATIONAL DAM SAFETY PROGRAM
NEW ENGLAND DIVISION - CORPS OF ENGINEERS

JOB SPECIFICATION

NG	ANK	NMIN	ICAY	IMR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	10	0	0	0	0	0	-4	0
			JOPER	NWT	LPOPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLANE 1 NRTIO= 1 LRTIO= 1

RRTIO= 0.00

.....

HYDROGRAPH ROUTING

ROUTED OUTFLOW FROM CONWAY ELECTRIC DAM

ISTAG	ICOMP	IECON	ITAPE	JPLT	UPRT	INAME	ISTAGE	IAUTO
DAM 0	1	0	0	0	0	1	0	0
ROUTING DATA								
CLOSS	AVG	IRIS	ISAME	IOFT	IPMP		LSTR	
0.0	0.00	1	1	0	0			
NSTPS NSTOL LAG FMSKK X TSK STORA ISPRAT								
1	0	0	0.000	0.000	0.000	-298.	-1	
STAGE	298.00	300.00	302.00	394.00	306.00	308.00	310.00	315.00
FLOW	0.00	596.00	2816.00	5173.00	8119.00	11931.00	16354.00	29543.00

SURFACE AREA= 0. 5. 17. 20.

CAPACITY= 0. 117. 137. 322.

ELEVATION= 228. 298. 300. 310.

CAEL	SP-10	COGW	EXP.	ELEV	COOL	CARLA	EXPL
298.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA
TOPEL COOD EXFO DAMWID
298.0 0.0 0.0 0.

DAM PREACH DATA
BRWID 36. 0.00 228.00 1.00 298.00 298.00
Z ELBM TFAIL WSEL RAILL

BEGIN DAM FAILURE AT 0.00 HOURS

PEAK OUTFLOW IS 3105. AT TIME 0.27 HOURS

D-12

LAST MODIFICATION: 26 FEB 79

HYDROLOGIC ANALYSIS OF CONWAY ELECTRIC DAM
NATIONAL DAM SAFETY PROGRAM
NEW ENGLAND DIVISION - CORPS OF ENGINEERS

0 0 -4 0

ROUTED OUTFLOW FROM CONWAY ELECTRIC DAM

-298
-15
29343

CONWAY ELECTRIC DAM BREACH ROUTING - REACH 1

163 325 163

CONWAY ELECTRIC DAM BREACH ROUTING TO HAZARD

142 650 142

CONWAY ELECTRIC DAM BREACH ROUTING - REACH 3

136 1300 136

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

ROUTE HYDROGRAPH TO
ROUTE HYDROGRAPH TO
ROUTE HYDROGRAPH TO
ROUTE HYDROGRAPH TO
END OF NETWORK

D-11

FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9
				.08	.09	.10	.15	.20	.30	.40	.50	1.00
RATIOS APPLIED TO FLOWS												
HYDROGRAPH AT CUNAWAY	26.10	1	4276.	4313.	5247.	8021.	10695.	16042.	21390.	26737.	53975.	
	(67.60)	(121.14)	(136.22)	(151.42)	(227.14)	(302.85)	(454.27)	(605.70)	(757.12)	(1518.24)		
ROUTED TO	26.10	1	4055.	4766.	5234.	8002.	10694.	15051.	21414.	26765.	53904.	
	(67.60)	(120.50)	(135.53)	(151.03)	(226.59)	(302.81)	(454.52)	(606.34)	(757.89)	(1518.79)		

CUMULATIVE OF DAM SAFETY ANALYSIS

PLAN 1	ELEVATION	INITIAL VALUE	SEILLWAY CREST	TOP OF DAM
	STORAGE	298.00	298.00	304.00
	OUTFLOW	8.	8.	118.
		0.	0.	6646.

RATIO	MAXIMUM	MAXIMUM	MAXIMUM	DURATION	TIME OF	TIME OF
OF	RESERVOIR	DEPTH	STORAGE	OVER TOP	MAX OUTFLOW	FAILURE
PMF	W.S.-ELEV	OVER DAM	AC-FT	HOURS	HOURS	HOURS
.08	303.22	0.00	95.	0.00	17.75	0.00
.09	303.67	0.00	94.	0.00	17.75	0.00
.10	304.11	0.00	101.	0.00	17.75	0.00
.15	305.32	.72	135.	2.00	17.75	0.00
.20	307.35	2.35	162.	3.50	17.75	0.00
.30	309.86	4.56	211.	5.50	17.75	0.00
.40	311.92	6.92	253.	6.75	17.75	0.00
.50	313.23	8.63	295.	7.75	17.75	0.00
1.00	323.09	19.08	528.	11.00	17.75	0.00

D-10

ROUTED OUTFLOW FROM CONWAY ELECTRIC DAM

STAGE	258.00	300.00	302.00	304.00	306.00	308.00	310.00	312.00	314.00	316.00
FLC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SURFACE AREA	0.	0.	5.	17.	20.					
CAPACITY	0.	0.	8.	20.	214.					
ELEVATION	228.	293.	298.	300.	310.					

STAGE	258.00	300.00	302.00	304.00	306.00	308.00	310.00	312.00	314.00	316.00
FLC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SURFACE AREA	0.	0.	5.	17.	20.					
CAPACITY	0.	0.	8.	20.	214.					
ELEVATION	228.	293.	298.	300.	310.					

STAGE	258.00	300.00	302.00	304.00	306.00	308.00	310.00	312.00	314.00	316.00
FLC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SURFACE AREA	0.	0.	5.	17.	20.					
CAPACITY	0.	0.	8.	20.	214.					
ELEVATION	228.	293.	298.	300.	310.					

STAGE	258.00	300.00	302.00	304.00	306.00	308.00	310.00	312.00	314.00	316.00
FLC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SURFACE AREA	0.	0.	5.	17.	20.					
CAPACITY	0.	0.	8.	20.	214.					
ELEVATION	228.	293.	298.	300.	310.					

STAGE	258.00	300.00	302.00	304.00	306.00	308.00	310.00	312.00	314.00	316.00
FLC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SURFACE AREA	0.	0.	5.	17.	20.					
CAPACITY	0.	0.	8.	20.	214.					
ELEVATION	228.	293.	298.	300.	310.					

STAGE	258.00	300.00	302.00	304.00	306.00	308.00	310.00	312.00	314.00	316.00
FLC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SURFACE AREA	0.	0.	5.	17.	20.					
CAPACITY	0.	0.	8.	20.	214.					
ELEVATION	228.	293.	298.	300.	310.					

STAGE	258.00	300.00	302.00	304.00	306.00	308.00	310.00	312.00	314.00	316.00
FLC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SURFACE AREA	0.	0.	5.	17.	20.					
CAPACITY	0.	0.	8.	20.	214.					
ELEVATION	228.	293.	298.	300.	310.					

D-9

D-8

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 PARTIO= 9 LPTIO= 1

RTICS=	.08	.09	.10	.15	.20	.30	.40	.50	1.00
--------	-----	-----	-----	-----	-----	-----	-----	-----	------

SUB-AREA RUNOFF COMPUTATION.

INFLUX TO COMPANY RESERVES

ISTAG	ICOMP	IFCCN	ITAFE	JFLT	JPRY	INAVE	ISTAGE	IAUTO
CONWAY	0	0	0	0	0	1	0	0

LOCAL	ISAVE	ISNOW	RATIO	TRSDC	TPSC	SNAP	TARFA	IUMC	INYS
0	1	0	0.000	26.10	0.00	0.00	26.10	1	1

PRECIP DATA		R48		R96	
SPFE	RMS	R4	R12	R24	R72
0.00	20.00	100.00	104.00	122.00	0.00

TRAFEC COMPUTED BY THE PROGRAM IS .631
".00 20

LCSS DATA										
LCSCPT	STRKR	DLTYR	RTIOL	ERAIN	STKRS	FTIOX	STRTL	CUSTL	ALSMX	RTINF
0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	.05	0.00	0.00

```
UNIT HYDROGRAPH DATA
TD= 2.70 CP= .60 NTA= 0
```

```

RECESSION DATE
STRTO= -1.70 GPCSN= -.10 RYTO= 2.00

```

UNIT	HYDROGRAPH	47	END-OF-PERIOD	ORDINATES	LAC=	2.01	HOURS	CP=	.61	VCL=	1.09
213.	789.	1536.	2500.	3453.	4285.	4850.	5152.	5090.		4577.	
212.	1632.	3201.	2821.	2486.	2191.	1931.	1702.	1500.		1322.	
1155.	1027.	906.	797.	703.	619.	546.		424.		374.	

	190.	225.	175.	136.	120.	106.
100.	240.	255.	190.	154.	120.	106.
110.	255.	285.	225.	175.	136.	120.
120.	285.	320.	255.	200.	154.	136.
130.	320.	360.	285.	225.	175.	154.
140.	360.	400.	320.	255.	200.	175.
150.	400.	440.	360.	285.	225.	200.
160.	440.	480.	400.	320.	255.	225.
170.	480.	520.	440.	360.	285.	255.
180.	520.	560.	480.	400.	320.	285.
190.	560.	600.	520.	440.	360.	320.
200.	600.	640.	560.	480.	400.	360.
210.	640.	680.	600.	520.	440.	400.
220.	680.	720.	640.	560.	480.	440.
230.	720.	760.	680.	600.	520.	480.
240.	760.	800.	720.	640.	560.	520.
250.	800.	840.	760.	680.	600.	560.
260.	840.	880.	800.	720.	640.	600.
270.	880.	920.	840.	760.	680.	640.
280.	920.	960.	880.	800.	720.	680.
290.	960.	1000.	920.	840.	760.	720.
300.	1000.	1040.	960.	880.	800.	760.
310.	1040.	1080.	1000.	920.	840.	800.
320.	1080.	1120.	1040.	960.	880.	840.
330.	1120.	1160.	1080.	1000.	920.	880.
340.	1160.	1200.	1120.	1040.	960.	920.
350.	1200.	1240.	1160.	1080.	1000.	960.
360.	1240.	1280.	1200.	1120.	1040.	1000.
370.	1280.	1320.	1240.	1160.	1080.	1040.
380.	1320.	1360.	1280.	1200.	1120.	1080.
390.	1360.	1400.	1320.	1240.	1160.	1120.
400.	1400.	1440.	1360.	1280.	1200.	1160.
410.	1440.	1480.	1400.	1320.	1240.	1200.
420.	1480.	1520.	1440.	1360.	1280.	1240.
430.	1520.	1560.	1480.	1400.	1320.	1280.
440.	1560.	1600.	1520.	1440.	1360.	1320.
450.	1600.	1640.	1560.	1480.	1400.	1360.
460.	1640.	1680.	1600.	1520.	1440.	1400.
470.	1680.	1720.	1640.	1560.	1480.	1440.
480.	1720.	1760.	1680.	1600.	1520.	1480.
490.	1760.	1800.	1720.	1640.	1560.	1520.
500.	1800.	1840.	1760.	1680.	1600.	1560.
510.	1840.	1880.	1800.	1720.	1640.	1600.
520.	1880.	1920.	1840.	1760.	1680.	1640.
530.	1920.	1960.	1880.	1800.	1720.	1680.
540.	1960.	2000.	1920.	1840.	1760.	1720.
550.	2000.	2040.	1960.	1880.	1800.	1760.
560.	2040.	2080.	2000.	1920.	1840.	1800.
570.	2080.	2120.	2040.	1960.	1880.	1840.
580.	2120.	2160.	2080.	2000.	1920.	1880.
590.	2160.	2200.	2120.	2040.	1960.	1920.
600.	2200.	2240.	2160.	2080.	2000.	1960.
610.	2240.	2280.	2200.	2120.	2040.	2000.
620.	2280.	2320.	2240.	2160.	2080.	2040.
630.	2320.	2360.	2280.	2200.	2120.	2080.
640.	2360.	2400.	2320.	2240.	2160.	2120.
650.	2400.	2440.	2360.	2280.	2200.	2160.
660.	2440.	2480.	2400.	2320.	2240.	2200.
670.	2480.	2520.	2440.	2360.	2280.	2240.
680.	2520.	2560.	2480.	2400.	2320.	2280.
690.	2560.	2600.	2520.	2440.	2360.	2320.
700.	2600.	2640.	2560.	2480.	2400.	2360.
710						

	H.P.M.	PERIOD	RAIN	EXCS	LOSS	FIND-OF-PERIOD FLOW COMP G MO.DA	HR-MN PERIOD	RAIN	EXCS	LOSS	COWP G
M.C.D.A											
D											
							SUM	20.28	16.06	1.20	171664.9
							(S)	515.(	485.)	30.)	37780.52

1	A1	HYDROLOGIC ANALYSIS OF CONWAY ELECTRIC DAM									
2	A2	NATIONAL DAM SAFETY PROGRAM									
3	A3	NEW ENGLAND DIVISION - CORPS OF ENGINEERS									
4	E	300	0	15	0	0	0	0	-4	0	0
5	E1	E									
6	J	1	5	1							
7	J1	0.08	0.09	0.10	0.15	0.20	0.30	0.40	0.50	1.00	
8	K	0	CONWAY					1			
9	K1	INFLOW TO CONWAY RESERVOIR									
10	N	1	1	26.1	0	26.1				1	
11	P	0	20	100	104	122					
12	T							0	0.05		
13	A	2.0	0.6								
14	V	-1.7	-0.1	2							
15	K	1	DAM 0								
16	P1	ROUTED OUTFLOW FROM CONWAY ELECTRIC DAM									
17	Y			1							
18	Y1	1						-298	-1		
19	Y4	294	300	302	304	306	308	310	315		
20	Y5	0	596	2816	5173	8119	11531	16354	29543		
21	Y4	0	0	5	17	20					
22	FE	208	253	298	300	310					
23	FE	296									
24	SD	305									
25	K	69									

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

SOURCE HYDROGRAPH AT CONWAY
 ROUTE HYDROGRAPH TO DAM 0
 END OF NETWORK

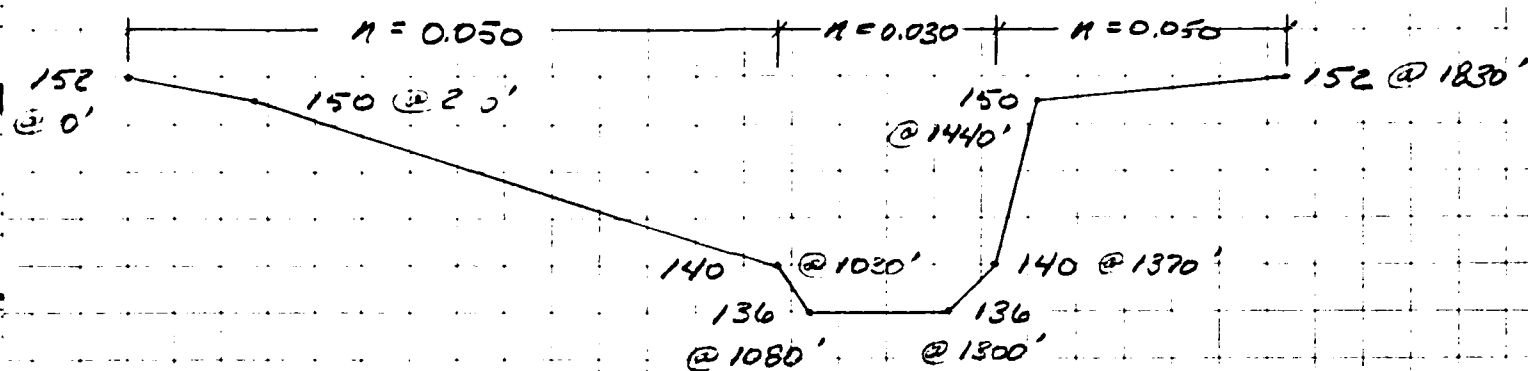
D-7



O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
CONWAY ELECTRIC DAM - H.E.H	D-6	JFR	12/29/80	2060-002

SECTION THREE (DOWNSTREAM VIEW)



$L \approx 4300'$

CHANNEL SLOPE : 0.0014 %



O'BRIEN & GERE

SUBJECT

CONWAY ELECTRIC DAM - H&H

SHEET

D-5

BY

SHS

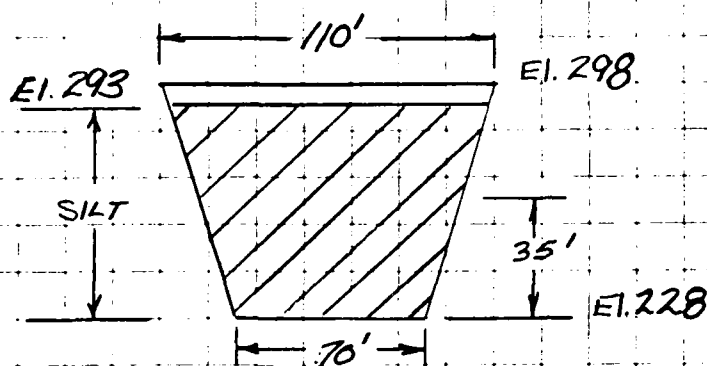
DATE

12/15/80

JOB NO

2060-002

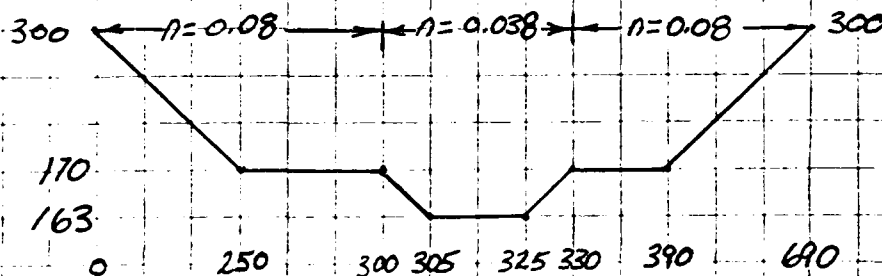
BREACH CONFIGURATION:



Breach Width =

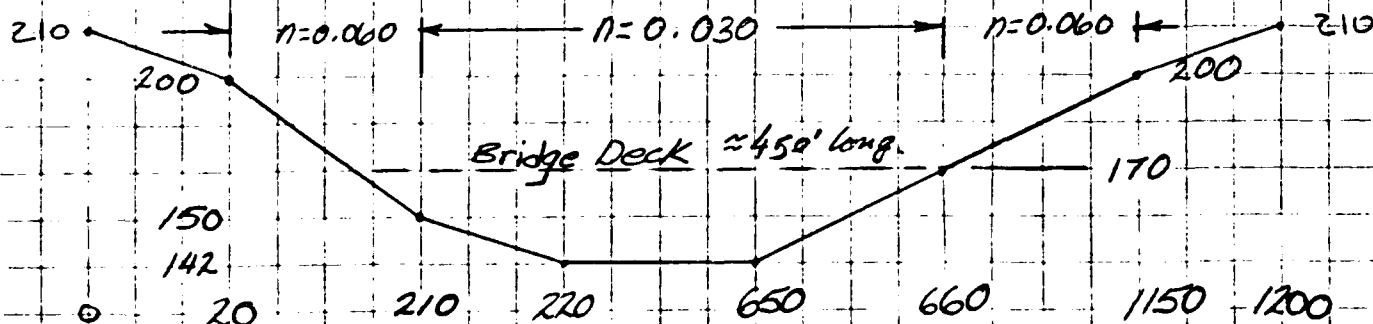
$$\frac{(70+110)40}{2} = 36 \text{ ft.}$$

SECTION 1 - Confluence South & Deerfield Rivers



Channel Slope = 0.019
L ≈ 3,500 ft.

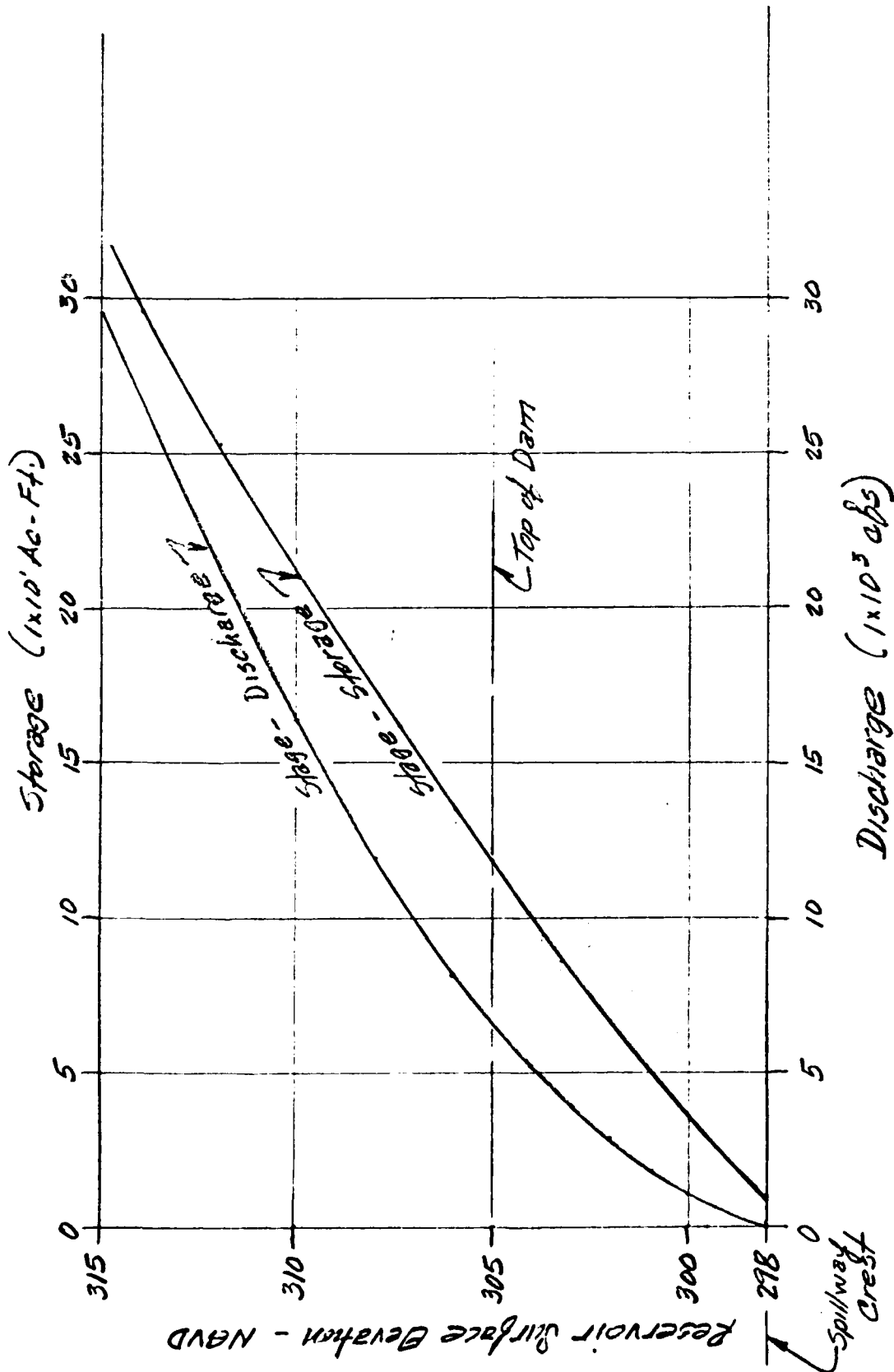
SECTION 2, HAZARD - Stillwater Bridge



Channel Slope = 0.0021'/' L ≈ 10,000 ft.

SUBJECT	SHEET	BY	DATE	JOB NO
Conway Electric Dam H & H	D-4	ET	12/30/80	2060-002

stage-storage & stage-discharge curves



**O'BRIEN & GERE**

SUBJECT

CONWAY ELECTRIC DAM - H&H

SHEET

D-3

BY

SHS

DATE

12/15/80

JOB NO

2060-002

PMP DATA:

From HMS #33-24 hr., 200 sq. mi. Index Rainfall is 20 inches.

Distribution -

6 hr. % - 100

12 hr. % - 104

24 hr. % - 122

STAGE-DISCHARGE COMPUTATIONS:Spillway - $Q_s = CLH^{3/2}$ $C = 3.2$ $L = 110$ feetDam - $Q_d = CLH^{1.5}$ $C = 2.8$ $L = 55$ feet
(left abutment wall)STAGE-DISCHARGE TABULATION

ELEVATION	SPILLWAY		DAM		CFS TOTAL
	HEAD	DISCHARGE	HEAD	DISCHARGE	
298	0	0	-	-	0
300	2	996	-	-	996
302	4	2816	-	-	2816
304	6	5173	-	-	5173
306	8	7965	1	154	8119
308	10	11,131	3	800	11,931
310	12	14,632	5	1,722	16,354
315	17	24,673	10	4,870	29,543



SUBJECT

CONWAY ELECTRIC DAM - H&H

SHEET

D-2

BY

SHS

DATE

12/15/80

JOB NO.

2060-002

HYDROLOGIC & HYDRAULIC
COMPUTATIONS

Drainage Area - 26.1 sq. mi.

Reservoir Area -

Elevation 228 - 0 Toe of Dam

Elevation 293 - 0 Existing Res. Bottom

Spillway
Crest (Elev. 298) - 5 Acres

Elevation 300 - 17 Acres

Elevation 310 - 20 Acres

SNYDER Hydrograph Coefficients:

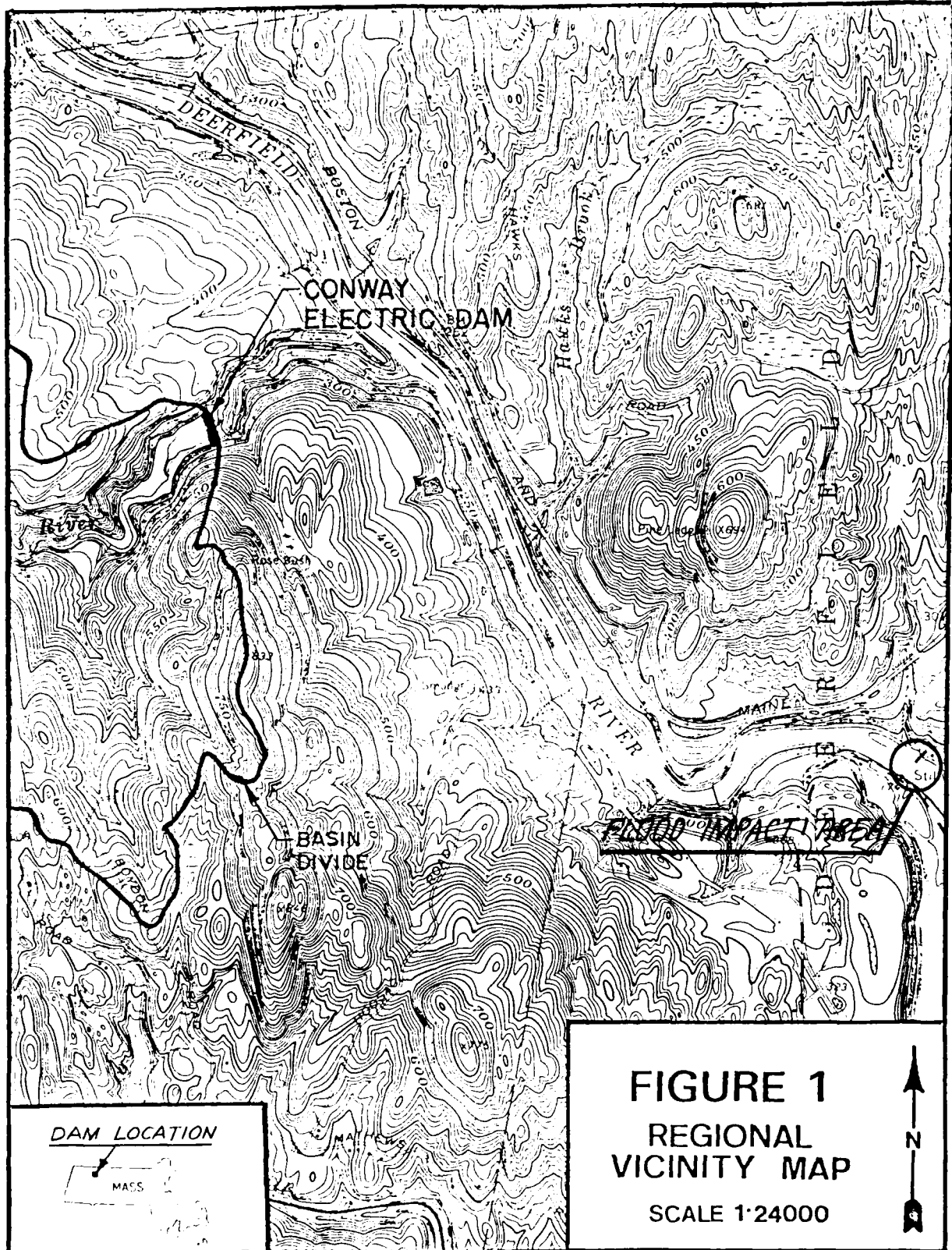
$$C_t = 2.0 \quad C_p = 0.6$$

$$L = 13 \text{ miles} \quad L_{ca} = 8 \text{ miles}$$

$$\therefore T_p = C_t (L \cdot L_{ca})^{0.3}$$

$$= 2.0 (13 \times 8)^{0.3}$$

$$T_p = 8.0 \text{ Hours}$$



CONWAY ELECTRIC DAM
APPENDIX D
HYDROLOGIC & HYDRAULIC COMPUTATIONS
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Section 3	D-6
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HEC-1 Dam Safety Version, Breach Computer Output	D-11 through D-15

0.0600 0.0300 0.0600 142.0 160.0 10000. 000210

CROSS SECTION COORDINATES--STA+ELEV,STA+ELEV--ETC

0.00 210.00 200.00 200.00 210.00 150.00 220.00 142.00 650.00 170.00 1150.00 200.00 1200.00 210.00

STORAGE	0.00	93.68	187.70	282.05	376.72	471.73	567.07	662.75	758.75	855.16
	522.38	1050.46	1149.39	1249.18	1344.82	1451.33	1553.58	1656.99	1760.97	1865.90
OUTFLOW	0.00	893.50	2834.04	5565.36	8941.19	13015.68	17622.17	22765.03	28415.76	34591.30
	41274.21	48420.07	56015.75	64049.51	72510.85	81390.30	90679.29	100369.99	110455.24	120928.47
STAGE	142.00	142.95	143.89	144.84	145.79	146.74	147.68	148.63	149.58	150.53
	16.17	152.42	153.37	154.32	155.26	156.21	157.16	158.11	159.05	160.00
FLC	0.00	893.50	2834.04	5565.36	8941.19	13015.68	17622.17	22765.03	28415.76	34591.30
	41274.21	48420.07	56015.75	64049.51	72510.85	81390.30	90679.29	100369.99	110455.24	120928.47

MAXIMUM STAGE IS 143.8

HYCROGRAPH ROUTING

CONWAY ELECTRIC DAM BREACH ROUTING - REACH 3

ISTAG	ICOMP	IECON	ITAPE	JFLT	INAME	ISTAGE	IAUTO
REACH3	1	0	0	0	1	0	0
ROUTING DATA							
GROSS	CLOSS	AVG	IRCS	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0
NSTPS - NSTDL							
1	0	0	0.000	0.000	0.000	0.000	0
LAG ANSKK X TSK STORA ISPRAT							
0	0	0.000	0.000	0.000	-1.	0	0

NORMAL DEPTH CHANNEL ROUTING

GN(1) GN(2) GN(3) ELNVT ELNAX PLNTH SEL
0.000 0.030 0.0500 136.0 150.0 4300. 00140

CROSS SECTION COORDINATES--STA+ELEV,STA+ELEV--ETC

0.00 152.00 200.00 150.00 1030.00 140.00 1000.00 136.00 136.00
1370.00 140.00 1440.00 150.00 1830.00 152.00

STORAGE	0.00	15.81	35.22	55.24	76.87	100.11	125.48	155.38	190.10	229.65
	274.02	323.21	377.23	434.07	499.73	568.22	641.53	713.66	802.62	890.40
OUTFLOW	0.00	250.15	809.84	1625.14	2682.16	3977.33	5630.95	7655.26	9994.77	12670.89
	15702.74	10108.28	22934.73	27108.73	31756.50	36603.90	42326.45	48318.39	54797.70	61771.11
STAGE	136.00	136.74	137.47	138.21	138.95	139.68	140.42	141.16	141.89	142.63
	143.37	144.11	144.84	145.58	146.32	147.05	147.79	148.53	149.26	150.00
FLOW	0.00	250.15	809.84	1625.14	2682.16	3977.33	5630.95	7655.26	9994.77	12670.89
	15702.74	10108.28	22934.73	27108.73	31756.50	36603.90	42326.45	48318.39	54797.70	61771.11

MAXIMUM STAGE IS 138.9

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

RATIOS APPLIED TO FLOWS

OPERATION	STATION	AREA	PLAN	RATIO	1
					0.00
ROUTED TO	DAM 0	0.00	1	2984.	
	(	0.00)	(	84.50)	(
ROUTED TO	REACH1	0.00	1	2772.	
	(	0.00)	(	78.51)	(
ROUTED TO	REACH2	0.00	1	2567.	
	(	0.00)	(	72.69)	(
ROUTED TO	REACH3	0.00	1	2550.	
	(	0.00)	(	72.21)	(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 290.00 117. 0.	SPILLWAY CREST 298.00 117. 0.	TOP OF DAM 298.00 117. 0.	RATIO OF PNF	MAXIMUM RESERVOIR ELEVATION	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.00	297.97	0.00	117.	3105.	0.00	297.97	0.00	117.	3105.	0.00	.27	9.00

PLAN 1 STATION REACH1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.00	2772.	170.1	.33

PLAN 1 STATION REACH2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.00	2567.	143.8	.50

PLAN 1 STATION REACH3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.00	2550.	138.9	.50

D-15

INVENTORY OF DAMS IN THE UNITED STATES

STATE	DIVISION	CONGR. DIST.	STATE	COUNTY	DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY | MO | YR
44	403	4011				CONWAY ELECTRIC DAM	42 32.3	72 40.1	05 MAR 81

POPULAR NAME	NAME OF IMPONDMENT
	CONWAY ELECTRIC RESERVOIR

REGION BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01 04	SOUTH RIVER	DEERFIELD	5	500

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STURGE HYDRAULIC HEIGHT (FEET)	IMPOUNDING CAPACITIES (ACRE-FT.)	NORMAL
PG-WEUT	1895	M	77	77	118

DIST OWN FED R PRV/FED SCS A VER/DATE

REMARKS
23-SINCE 1921 R, 22-WEHUILT 1910 21-TIMBER CRIB

D/S HAS (FEET)	SPILLWAY TYPE	WIDTH (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (KW)	PROPOSED (KW)	NAVIGATION LOCKS
2	PG-5	110	6050	35000		

OWNER	ENGINEERING BY	CONSTRUCTION BY
STATE OF N. A. PAGE	UNKNOWN	UNKNOWN

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	NONE

INSPECTION BY	INSPECTION DATE DAY | MO | YR	AUTHORITY FOR INSPECTION
CHWIER & GENE ENGINEERS	02 DEC 80	PL 92-367

REMARKS

END

FILMED

7-85

DTIC